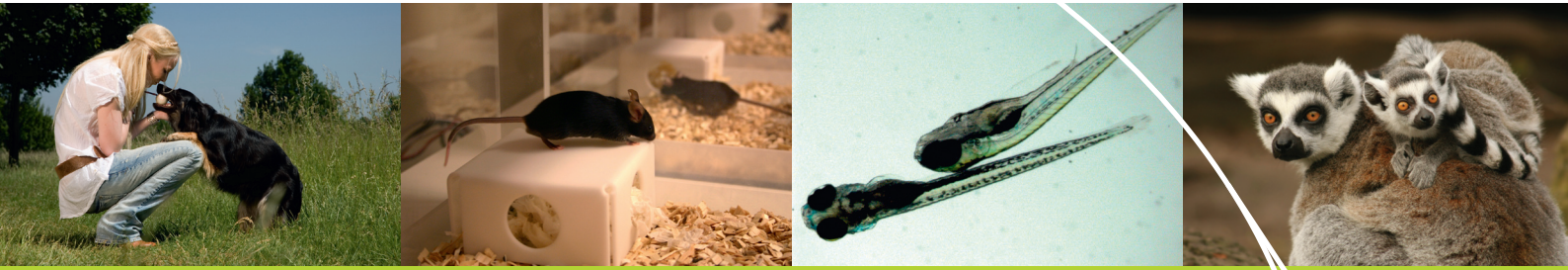


# Innovative Solutions for Animal Behavior Research



## Dear customer,

It is a great pleasure to present to you the fifth edition of our catalog of products and solutions for animal behavior research. Our portfolio includes a wide range of software tools, hardware products, and services that support the needs of scientists around the world. Our systems have found their way to more than 5.800 universities, research institutes, and companies in over 84 countries. Since the publication of the previous edition of this catalog, several new products and solutions have been released. You can read about these in the current edition.

This catalog presents an overview of all our products and integrated solutions, as well as examples of applications for which they can be put to use. We have done our best to make this catalog as complete as possible. Yet it is possible that you cannot find what you are looking for. In that case, please let us know too. It may be under development or we may consider your suggestion for future development.

Our team of hundred enthusiastic professionals, based in eight countries, and our network of international distributors are ready to help you. If you have any questions, comments, or suggestions, please contact us. Or simply keep in touch with our endeavors by subscribing to our digital newsletter.

Lucas P.J.J. Noldus, Ph.D.  
President



## How to use this catalog

In this catalog you will find an introduction to our company, followed by a thorough description of our products and services. Each product has its own benefits and features as well as many applications in research. We also list examples of these applications, referring you to up-to-date information of each application on our website.

If you have any questions, there are many ways to contact us. Please refer to the last pages of this catalog for contact details of all our offices.

## On our website

Of course, all our products and services are featured on our website as well. Here you will also find information about many different applications, training data, frequently asked questions, the events we visit, and much more. To stay up-to-date, subscribe to our Noldus Newsline or follow the Behavioral Research Blog!

*The technical support and product knowledge of Noldus' staff is superior and platinum standard. Their commitment to helping customers troubleshoot software and hardware problems and their persistence in making sure a solution is found, is the reason labs like my own go to them for software and hardware.*  
[Stephen Bonasera - USA]

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Noldus Information Technology was established in 1989 by Lucas Noldus, who has served as president of the company since then. Lucas holds a Ph.D. degree in animal behavior from Wageningen University. During his research on the behavioral ecology of parasitoid wasps, he developed the first version of what later became The Observer® software package. The program was unique in that it offered a general-purpose tool for behavioral recording and analysis, independent of the organism being studied. This tool attracted the attention from researchers within and outside entomology and triggered the start of a company for the development of software tools for behavioral research.

The Observer, launched in 1990, was the first in a series of successful software products, including EthoVision®, UltraVox™, Pocket Observer, Theme™, uLog™, CatWalk™, and FaceReader™. The introduction of the PhenoTyper® product line in 2004 marked our debut as a hardware manufacturer. Over the years we have evolved from a software vendor into a provider of integrated systems and solutions, comprising of software, hardware, and services. DanioVision™ is the latest addition to our product range. We can now supply complete behavioral research lab set-ups or rodent phenotyping facilities. But of course you can also come to us for a single software license or handheld computer.

## HEADQUARTERS AND REGIONAL OFFICES

Our headquarters are located in Wageningen, The Netherlands, hometown of Wageningen University and numerous research institutes famous for their expertise in life sciences, food, nutrition, and health. This places us amidst leading experts in neuroscience, farm animal behavior and welfare, insect behavior and ecology, and nature conservation. In 2005, we completed the construction of our own office



*Our North American headquarters.*

building, constructed on a 5.500 m<sup>2</sup> plot in the Wageningen Science Park. This three-storey building with 2.000 m<sup>2</sup> (21.500 sq ft) floor space offers superb facilities for employees and customers alike. State-of-the-art electronic engineering, mechanical engineering, and usability

labs and test facilities enable us to further professionalize our product development. As a customer, supplier, or development partner, you will enjoy the demonstration facilities and modern seminar, training, and meeting rooms. In 1996, we opened our first foreign subsidiary in Virginia, United States, which was followed by branch offices in North Carolina, Massachusetts, Washington state, and Canada. In Europe our international expansion started in Germany, followed by offices in France, Spain, and Hungary. In early 2009 we opened our first Asian branch office in Beijing, China.

## KEY BENEFITS OF NOLDUS SOLUTIONS

Our tools facilitate and accelerate the collection, analysis, and presentation of behavioral data. With Noldus tools, behavioral studies become more efficient and cost-effective. Our solutions are designed to offer you the following key benefits:

- *Enhanced quality* – Our advanced technology allows more accurate measurement of behavior and therefore a higher quality of collected data.
- *Increased productivity* – Automated systems replace manual work and allow you to do more in less time. By letting computers do the tedious routine work you can focus on more interesting tasks.
- *Optimal use of animal resources* – Our technology allows behavioral measurements to take place under natural and animal-friendly circumstances, while continuous automated observation maximizes the amount of information collected per animal. These advances contribute to the refinement and reduction of laboratory animal testing.

## COLLABORATION

Tools for science cannot be made without active involvement of scientists, the ultimate users of our tools. Scientists play a crucial role during the requirements specification of new products and during practical testing and scientific validation of prototypes. This is especially important for our automated measurement systems, which we only release onto the market after their reliability and validity has been proven in independent studies. An important player in this process is Delta Phenomics that offers contract research services in the field of animal behavior, in operation since early 2008. Several of our current products have their roots in academia and were developed in partnership with the original inventor. If you are an inventor yourself and would like to know if your invention might become a commercial product in the Noldus portfolio, please let us know. We strongly believe in the added value of interdisciplinary contacts and collaboration. Therefore, we actively participate in national and international collaborative projects, together with leading universities and research institutes. If you are building a project consortium and think that Noldus might be a valuable partner, don't hesitate to contact us.



*The beginning of an international collaboration.*

## TECHNOLOGY AND TOOLS COMING TO YOU!

Throughout the year we demonstrate our products at conferences and tradeshows around the world, from the large Society for Neuroscience annual meeting to small regional workshops and symposia. Next time you attend a conference, please stop by at the Noldus booth. And if we are not there but you think we should come next time, please let us know.



*A lively discussion at a Hungarian user meeting.*

Besides conference exhibits, we frequently organize user meetings and technology seminars. These are great opportunities to learn from each other and discuss product improvements and requirements for new products and services.

## THE MEASURING BEHAVIOR CONFERENCES

A unique event on our calendar is the biennial *Measuring Behavior* conference. This meeting, entirely devoted to methods and techniques in behavioral research, brings together scientists, inventors, and students from a wide range of research fields. Our company has invented the formula and is the organizer and main sponsor, but the conference program is established by an independent Scientific Program Committee. Since the start in 1996, this conference has grown enormously in popularity, attracting hundreds of delegates from all over the world.

Stay updated on the latest news and visit [www.measuringbehavior.org](http://www.measuringbehavior.org) regularly for more information, like us on [www.facebook.com/MeasuringBehavior](https://www.facebook.com/MeasuringBehavior) or join the *Measuring Behavior* group on LinkedIn.

## OUR CORPORATE VALUES

### OUR CUSTOMERS

The customer comes first! It is you we make our solutions for, so you deserve our attention and respect. You ultimately determine what we produce, so we strongly believe in user-centered design of products and services. Your questions, either before or after sales, are answered within a working day. When you call us, you get to speak to a person, not a computer. In an increasingly automated world, we cherish the personal relationships with our customers.

### OUR PEOPLE

Our human capital is our greatest asset. Therefore, we strive to create a pleasant and challenging working environment for our employees, in which each person can reach his or her maximum potential.

### QUALITY

Our products are designed to be best in class, manufactured to high-quality standards. Our product creation, production, and support processes are the result of 25 years of continuous improvement. Our quality system complies with the model of the European Foundation for Quality Management (EFQM). We are also a Microsoft Gold Certified Partner. Periodic evaluation involves all stakeholders in the value chain: customers, suppliers, and employees.

### KNOWLEDGE

Profound technical knowledge and a thorough understanding of the scientific domains in which our customers operate are prerequisites for the successful design, development, marketing, sales, and support of our products.

### CREATIVITY

For an innovative company, creativity is a lifeline. Throughout our organization, employees are encouraged to develop new ideas and think outside the box. This leads to original products and services, meeting the needs of scientists and practitioners, today and tomorrow.

### INTEGRITY

Count on us for honest communication, transparent pricing, and fair trade policies.

### RELIABILITY

Promise is debt. If we offer a product or service, you will get it. Internally, keeping your word is what the company expects of its employees and what they can expect of the company.

### SOCIETY

Our products support applications with a high value to society. Our customers use our tools in their search for new drugs to cure diseases, to support medical diagnosis and therapy, to improve educational systems, to enhance animal welfare, to develop environmentally sound pest control solutions, and to create more usable products and safer work environments.

### SUSTAINABILITY

Our processes are organized in such a way that reuse of materials is maximized and waste is minimized. We strive to carry out all our operations in an ecologically sustainable manner.



## YOUR RESEARCH: OUR PRIORITY

At our headquarters, product specialists set the priorities for product development and improvement. This includes the features of the next release of our software products as well as the instruments needed by animal behavior scientists in the future. We consult with the leading experts in the field and monitor relevant



## TECHNICAL SUPPORT

If you run into a problem of any kind, our support engineers are there to assist you. Our helpdesks guarantee a response within a business day and, when necessary, your question is passed on to a trainer or engineer for expert advice. We can even use the latest internet technology to remotely solve problems on your own computer. Furthermore, our on-line 24/7 technical support knowledgebase is created from genuine support questions. Your product-related comments are forwarded to the product manager, thus closing the user-centered design cycle.

products and services  
designed for  
**your**  
research

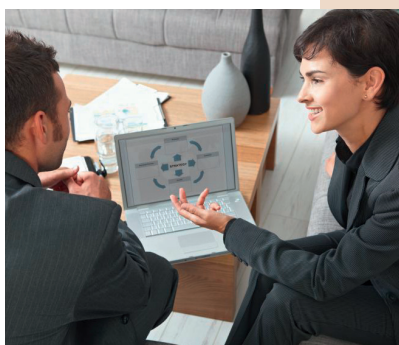
## ORDER DELIVERY: AT YOUR SERVICE

When you place an order, we get it to you as quickly as possible. Software-only orders are usually shipped the same or the next business day. Integrated systems are assembled and tested prior to delivery. We can come to your lab to install the entire system and provide training for you and your colleagues. Later on, you can benefit from our refresher or advanced training courses. In addition, a variety of service contracts are available to guarantee peace of mind and to ensure that the solution will be kept up-to-date and works well in the coming years.

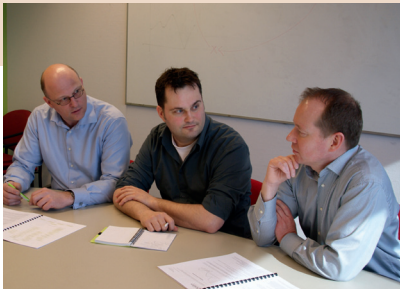


## OUR SALES FORCE: ALWAYS NEAR YOU

In order to be close to you, the network of Noldus offices and distributors is growing. Our knowledgeable representatives speak your language! With their academic background and expertise in animal behavior research, our sales people can advise you on a wide range of application questions. Whether you are setting up an entire behavioral research lab or just have a quick question, their expert advice is free. They will also be glad to visit you for an on-site demonstration. In the sales process, we translate your research requirements into a tailored solution, fitting your needs and budget.



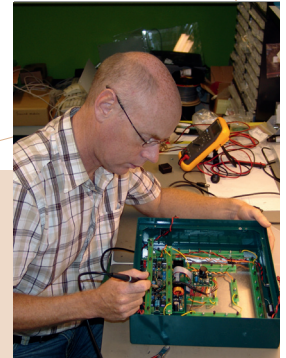
technology trends. Last but not least, we listen to you: beta tests, technical support questions, user questionnaires, and customer satisfaction surveys are invaluable sources of information in our product planning process.



Noldus Information Technology follows a user-centered design philosophy. Our entire business process is centered around you, the user of our products or services. In each step of product development, marketing, sales, delivery, and support, your needs and requirements are a driving force. Customer feedback fuels product improvement and the development of new products.

## RESEARCH & DEVELOPMENT

Once a product plan has been approved, a project team sets out to create it. This often starts with technical research in sensor technology, computer vision, or mathematics, leading to new data acquisition and analysis solutions. Our modern mechanical and electronic engineering facilities support in-house hardware design and prototyping. Interaction designers and software engineers create a high-quality system architecture, functional design, user interface, and robust program code. Last but not least, we pride ourselves in superior user documentation, in the form of comprehensive reference manuals, quick start guides in multiple languages, sample projects, and online video tutorials.



## TESTING: QUALITY WITHOUT COMPROMISE

Our systems meet the highest possible standards of quality and reliability and product testing forms an integral part of the development process. In each design cycle, testing takes place at several levels, carried out by independent test teams. Technical tests verify that the tool's functionality and performance is in accordance with the design specifications. Usability tests (in our dedicated experience lab and on-site) help us to optimize the software for you to use it effectively and efficiently. Validation studies, carried out by Delta Phenomics or academic partners prior to a new release, ascertain that the data output is correct.



## COMMUNICATION: SEEING IS BELIEVING

We do our best to inform you about our products and solutions as well as possible. Besides this catalog, extensive product information is published on our website. We attend numerous scientific events on which we demonstrate our systems to you and your colleagues. One of the highlights is the biennial *Measuring Behavior* conference.



Noldus is a company that strives for innovation in its products and solutions. In order to go beyond the current state-of-the-art and to push technologies past their current limits, we have established a laboratory where new techniques, concepts, and prototypes are developed. Noldus InnovationWorks has about ten full-time staff members and a variable number of interns, PhD, and MSc students.

## RESEARCH THEMES

The focus of our research is determined by a number of factors. The most important is our assessment of what innovations you would like. In addition, we take into consideration what technologies are ripe for development and which research consortia our partners are actively involved in. Current research themes include automatic recognition of behaviors, large-scale tracking of animals (both wild-life and farm animals), integration of multi-modal signals and complex event processing, reasoning, and real-time feedback.

## NOLDUS INNOVATION WORKS PRODUCTS

The research carried out by Noldus InnovationWorks is always applied research leading to concrete prototypes and products. Our policy is to make these products available to our customers and partners as soon as they are useable. That way, you get to use state-of-the-art technology and can measure behaviors in ways that would not otherwise be possible at that moment, and we get early feedback about what features you would like in the final product. Our normal process is that after a few months the Noldus InnovationWorks product is transferred to the Research & Development department to create the final product. You can find which products are currently available on the Noldus InnovationWorks website ([www.noldus.com/innovation-works](http://www.noldus.com/innovation-works)).



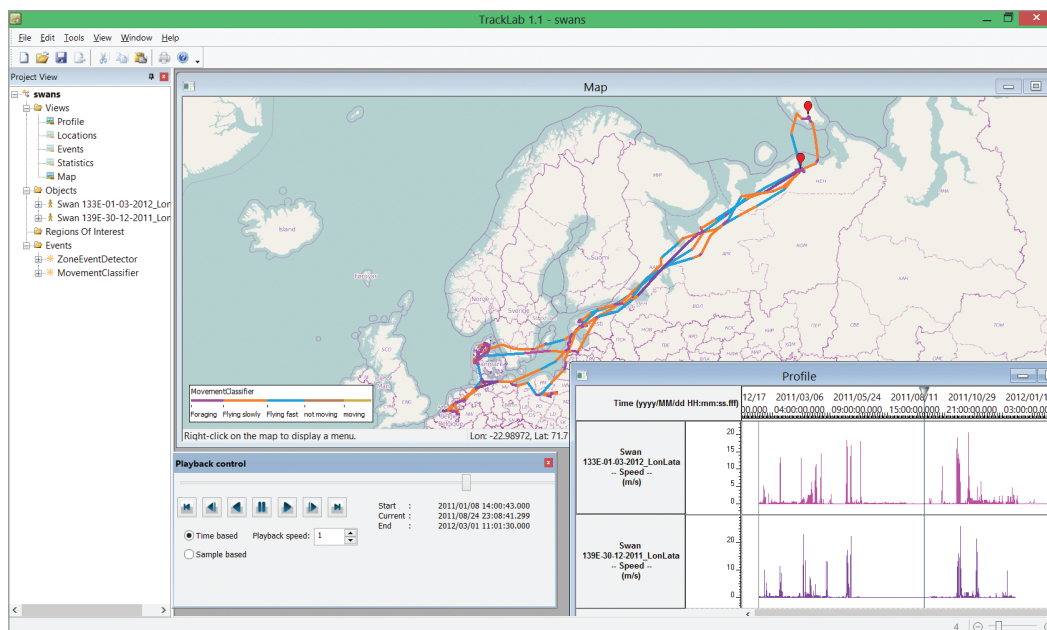
Ultra-wideband tag for accurate tracking.

In recent months, we have released several products including:

- **Track3D** – a video-based system that tracks insects and fish in three dimensions, and calculates a range of behavioral parameters.
- **TrackLab** – an integrated scalable solution which records the spatial location of animals using a variety of technologies including GPS, ultra-wide-band, and video and then visualizes the tracks on maps or floor plans and calculates a broad range of statistics quantifying the animals' behavior.

## RESEARCH PARTNERSHIPS

Our research is not carried out in isolated ivory towers, but always takes place in the context of projects together with academic and industrial partners. We are normally involved in about 20-30 projects at any one time, mostly funded either by Dutch regional or national government or by the European Union. An example of a recent project is Neuro-Bsik Mouse Phenomics in which a number of partners (Erasmus University Medical Center, Vrije Universiteit



Migration of Berwick's swans showing movement-based behavior. Courtesy of Netherlands Institute of Ecology. For illustrative purposes only.

Amsterdam, Utrecht University, and the University of Amsterdam) have carried out research into improving the management and treatment of brain disorders by identifying and phenotyping mouse models that can be used to develop therapies for such diseases. Noldus' role in that project includes developing software for the automatic detection of behaviors in rodents. Another project is E-Track in which a broad international consortium of academic and industrial partners is developing a complete solution for the measurement of movement and behavior of wildlife. Development of our TrackLab solution is carried out within this project.

We are always on the lookout for new projects, so feel free to contact us if you are initiating a project that might include development of innovations in tools and methods.

## MORE INFORMATION

For more information about the work and products of Noldus InnovationWorks, see our website: [www.noldus.com/innovationworks](http://www.noldus.com/innovationworks)

If you are forming a consortium to apply for a research grant, and you think that Noldus might be a suitable partner, please contact [partnerships@noldus.nl](mailto:partnerships@noldus.nl).



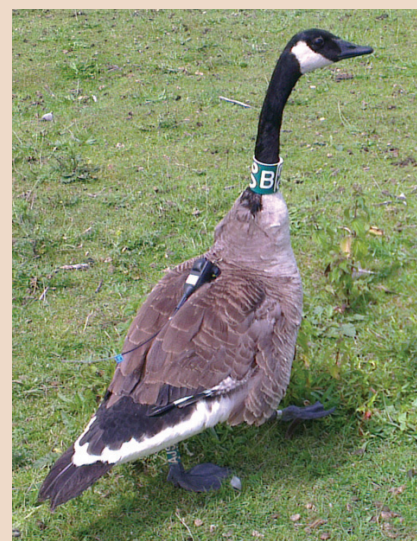
*Holstein-Friesian cow with GPS collar.*

## TRACKLAB

Whereas our video tracking solution EthoVision XT can track animals in an arena as large as the area that a single camera can 'see', TrackLab goes beyond that scale to larger areas. Whether you want to track animals real-time inside in a large barn, offline outside in a pasture, or across the entire range of an animal's migration, TrackLab can provide an integrated solution.

TrackLab supports a variety of sensor technologies including ultra-wideband, augmented GPS and various types of video so that we can implement the best tracking solution for your needs. If you already have sensors, we can integrate with them, or we can provide the entire setup for you.

Once installed, TrackLab is an integrated solution so that you do not need to worry about file conversions, data-clean-up, etc. You can visualize the track data in several different ways, such as tracks on a map or floor plan, heatmaps, and graphs of velocity, etc). A wide range of statistics are calculated, both for the entire track and for areas of interest which you can define yourself. TrackLab also has a number of more advanced features including movement-based behavioral classification, import of other data streams such as behaviors and 3D accelerometer data, and the ability to present stimuli or trigger events based on the animals' behavior and location.



*Canada goose with GPS tag. Courtesy of Netherlands Institute of Ecology.*

# OUR PRODUCT RANGE



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EthoVision® XT is the premier video tracking system for the automatic tracking and analysis of animal movement, activity, and behavior, delivering variables such as velocity, distance moved, zone visits, and much more. EthoVision XT detects the center point of any kind of animal and, in addition, the nose point and tail base of rats and mice. This enables the assessment of behaviors such as body elongation, interest in objects, or nose to nose contact in social interaction studies.

It is also much more than just tracking software, EthoVision XT is a platform you can use to fully automate your research, increasing productivity and efficiency while reducing human error. Real-time analysis of animal behavior even allows you to create sophisticated protocols for the control of external equipment. In other words, you can control interactions between your animals and external sensor and stimuli devices such as pellet dispensers, lights, and doors. Additionally, rat behaviors such as grooming, rearing, and jumping can be recognized automatically.

## BENEFITS

- Track any kind of animal in any type of enclosure, for any kind of test.
- Save time and reduce human error by automating your experiment.
- Choose the solution that fits your needs.
- Reliably track under varying conditions, even with background changes, uneven lighting, or multi-colored animals.
- Increase throughput by tracking animals in up to one hundred arenas simultaneously.
- Conduct social experiments with two or more animals.
- Freely select variables and parts of your data for analysis.
- Control when and where to track animals; either live or from video files.
- Use automatic behavior recognition for the automatic scoring of rat behavior.

## FEATURES

EthoVision XT is the ideal software tool for a wide range of behavioral experiments: it tracks any animal in any kind of enclosure. Both powerful and flexible, you can use it no matter what research field you are in: whether you want to test learning and memory in rats, measure the

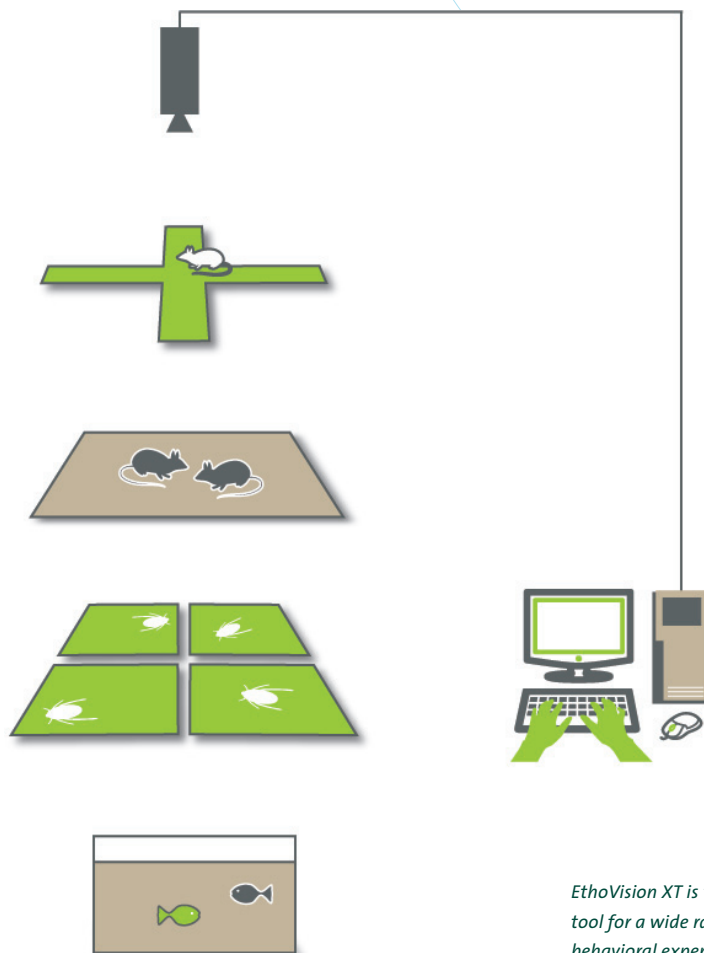
activity of zebrafish larvae, or conduct welfare studies with farm animals. With practical features for each phase of your experiment, EthoVision XT will help you out every step of the way – from setting up to the analysis of your data.

## From straightforward to sophisticated set-ups

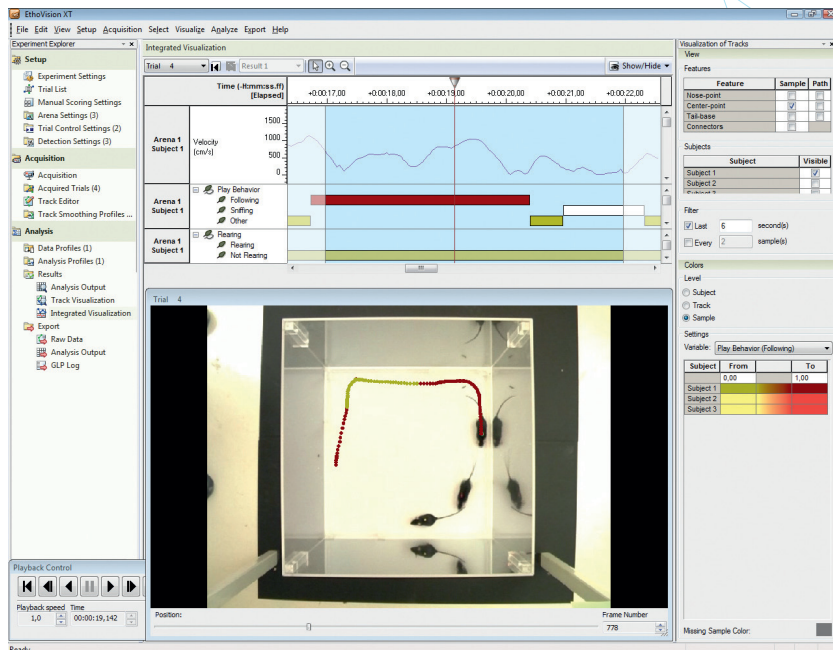
A basic EthoVision XT set-up consists of a video camera, positioned straight above the experiment arena (such as a maze or animal enclosure) and a computer running EthoVision XT. Camera images are sent to the computer and EthoVision XT tracks the animal and calculates a wide range of parameters related to activity, movement, and behavior. With EthoVision XT Base, you can conduct complete experiments with one animal in one testing area (arena). You can also use this base as a platform to build on. Add modules, more arenas, and other devices for the full automation of your research or a high throughput set-up. With the seven available modules, you can always create the package best suited for your research.

## PREPARE YOUR EXPERIMENT

Get off to a good start by preparing a trial list and defining your experiment settings. Make a list with each trial planned and define the points of interest within the testing arena. Or better yet, follow the user guidance wizard and let EthoVision XT do most of the work for you!



*EthoVision XT is the ideal tool for a wide range of behavioral experiments.*



*EthoVision XT offers you superb detection methods, offering accurate tracking of your animal.*

### User guidance with predefined settings

EthoVision XT includes templates for several popular tests, such as an open field, water maze, radial arm maze, and g6-well plate. Ideal for first-time users, it gives you a basic set-up for the animal and experiment of your choice, including predefined zones of interest (simply resize, drag, and drop) and predefined parameters of interest. Of course, you can fine-tune the settings to your research needs.

### Keep things organized

With EthoVision XT, you can build a comprehensive trial list. This incorporates all the planned trials and independent variables, such as the age, gender, experiment phase, or treatment group of each animal. Furthermore, each trial can be linked to a specific video file. When trials are coupled to prerecorded video files, you can perform a batch acquisition, meaning that all the files will be processed (tracked) consecutively, saving you a lot of time. This trial list is a practical tool: not only will it help you keep track of each test and the progress of your experiment, but you can also use the independent variables for selection and analysis. Your data for this trial list can be copied to and from Excel.

### Take control

EthoVision XT has Trial Control to automatically start or stop tracking, based on your predefined conditions. You may program EthoVision XT to start acquisition as soon as the animal is detected in the arena or to stop when the animal is within the proximity of an object. You can also start and stop tracking based on timing; stop tracking after 15 minutes, for example. When working with multiple arenas, the condition is applied to each arena individually. Creating the protocols for this Trial Control is easy – simply drag and drop ‘command blocks’ that contain conditions (the animal is detected in a feeding zone) and actions (trial ends).

Trial Control can also be used for the control of external applications. You can define the start of a sound file or a movie in Windows Media Player. This action may be based on animal behavior. For example, ‘play the movie when the animal is first detected in the outer zone of the arena’. These Trial Control features are part of EthoVision XT Base.

### ACQUIRE DETAILED DATA

Once your experiment is prepared, you are ready to start tracking your animals. You can do this live and even use a live feed to acquire a series of trials from. You can also record from video files and record video files while tracking live. It is possible to use up to four video cameras simultaneously. During each trial, the animal's coordinates are tracked. This tracking is of the center point or color marker of the animal. In the case of rats and mice, the center point, tail base, nose point, a combination of these three, or the color marker can be tracked. These coordinates are the basis for data analysis. From these, several parameters and statistics can be calculated.

### Series of trials from a live video feed

You can use a continuous live video feed to automatically acquire a series of trials. Take a water maze test, for example. You can program EthoVision XT to start tracking as soon as the animal is detected in the arena and stop after it has reached the platform or when 60 seconds have passed. Also, set an inter-trial interval of 10 minutes to give yourself time to guide the animal to the platform if necessary, remove the animal, clean up, and place the next subject. EthoVision XT will start the next trial automatically, but only after the 10 minutes have passed and the animal has been detected in the arena. Of course, you are able to choose start and stop conditions and the trial-interval yourself.

### Reliable detection

Meaningful tracking data depends on reliable detection of your animal. Continued tracking after your animal has urinated or reorganized its bedding can lead to mistakes which influence the results of your research. Uneven lighting or multi-colored animals may also cause detection issues. Noldus has created a set of highly accurate detection methods. You can fine-tune every method to your specific experimental conditions. This ensures accurate tracking even when set-ups are prone to background changes.

### Activity detection

In addition to tracking the animal, EthoVision XT includes activity detection. This detects changes in the arena instead of the animal's (body point) location. This method of detection is ideal for the study of freezing behavior, zebrafish embryonic tail flicks, zebrafish larvae heartbeat monitoring,



and more. It even works in situations where your animal is hard to detect, such as light animals on a light background.

### Automatic behavior recognition

In addition to automatically acquired variables such as velocity, distance moved, rotations, and presence in a zone, EthoVision XT now also automatically recognizes ten specific rat behaviors. It is an accurate, consistent, and tireless system that will help you gain objectivity and efficiency in your research. Behaviors recognized include grooming, jumping, supported and unsupported rearing, twitching, sniffing, walking, resting, drinking, and eating.

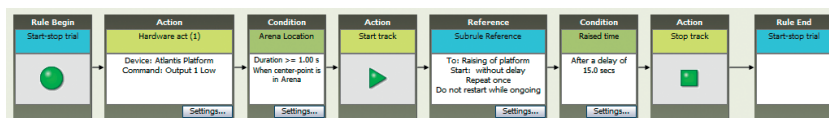
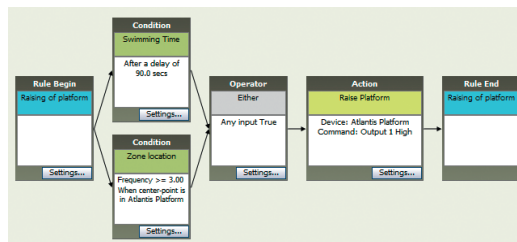
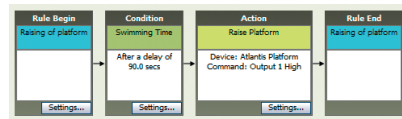
### Manual event recording

You can use the Manual Event Recorder in EthoVision XT to score behaviors manually. This built-in tool allows you to define a list of behaviors and score them during data acquisition. This data can be selected, analyzed, and visualized in sync with the tracking data gathered. The Manual Event Recorder is also an ideal tool to validate and fine-tune the detection of behaviors such as the stretch attend posture (body elongation).

### GET MEANINGFUL RESULTS

After the collection of data, it needs to be translated into meaningful results. The first step in analysis of your data, is data selection. Visualization of your data helps you to spot trends easily. Finally, a range of statistics will help you to analyze the results effectively.

*With Trial & Hardware Control you can program external devices. This example shows three ways to program the on-demand Atlantis platform in a water maze.*



### Intuitive selection tools

EthoVision XT offers several tools for this job. You can pick certain trials or select segments according to time interval, independent variables, or animal behavior and location. Intuitive condition and action blocks allow you to easily create a data selection profile as straightforward or complex as you need it to be. For example, select the data from all male subjects that underwent treatment A.

### In-depth analysis

EthoVision XT offers a wide range of parameters to perform in-depth analysis. These can be related to the travelling distance, time, location, path shape, individual behavior, and social behavior. This list also includes manually and automatically scored behaviors and hardware events. For each parameter, several statistics can be calculated, such as latencies, durations, standard error, standard deviation, mean, total, and frequency. Think of total distance moved, minimum velocity, or frequency of visits to the feeding zone. There are also specific parameters for social interaction studies, such as percentage of time spent in prox-

**Raise the platform in a water maze after the animal has spent 90 seconds swimming in search of it.**

**Raise the platform in a water maze after the animal has spent 90 seconds swimming in search of it OR when he has been swimming over its location 3 times or more.**

**Start the trial when the animal is detected for one second inside the water maze. Raise the platform in the water maze after the animal has spent 90 seconds swimming in search of it OR when he has been swimming over its location 3 times or more. Wait 15 seconds after the platform is raised before ending the trial.**

*EthoVision XT allows me to track videos accurately and reliably. Now I can use the hours that I used to spend with timers, pen and paper working on other areas of my research. [Jacqueline Womersley – South Africa]*

imity to another animal and relative movement. Some examples of the results of EthoVision XT data selection and analysis include: the time spent in the open zones of an elevated zero or plus maze, which allows you to measure anxiety related responses. The stretch-attend posture (body elongation) is often used to measure risk assessment or exploratory behavior. Additionally, the time spent immobile serves as a measure of fear.

#### Group statistics

In most experiments, you are interested in how the results compare amongst different groups of animals. In addition to statistics presented per trial, EthoVision XT also compares different groups for you. Results are displayed in tables and graphs and the data presented is based on your selection of data (data profile) and variables of interest (analysis profile). This way, you can compare the results of the training phase with those of the testing phase and/or the results between treatment groups. You can adjust the layout of the graph and use box or line graphs to easily spot trends in your data.

#### Automatic analysis

Analysis can also take place automatically, right after your trial has ended. This is based on your pre-selection of data (data profile) and variables of interest (analysis profile). You can also perform a batch analysis, analyzing all your trials at one push of the button. On top of that, you can combine this with batch acquisition. This means that when you line up your videos and select the parts of the data and the variables you are interested in, it will only take one push of the button to acquire and analyze all your data. You can even let EthoVision XT do this overnight!

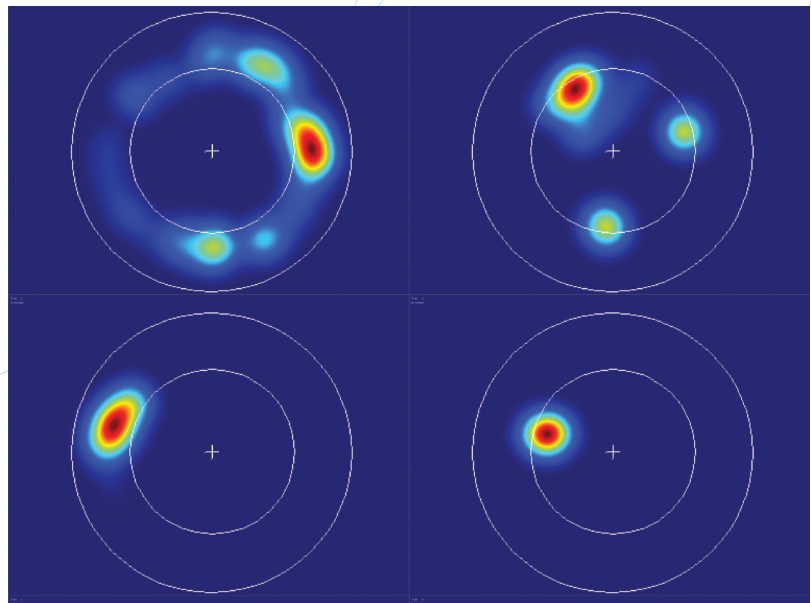
#### Multifunctional visualization

Visualization of your data is useful for a number of reasons. You can visualize data to get an immediate feel for it and see how you want to proceed with the selection. Visualization is also

a form of analysis itself and it is an intuitive way of showing others the results of your data. With EthoVision XT, you can visualize your data in several ways. Plot the trials to view multiple trials side by side or choose integrated visualization to display the video, the animal's path, and the values of the selected parameters in one dynamic, synchronized view. To instantly recognize values of parameters, you can display tracks in a color gradient and show, for example, variation in velocity with low speed in yellow to high speed in red.

#### Heatmaps

It is easy to spot where your animals spent their time when your data is presented in heatmaps. EthoVision XT has a built-in Heatmap Generator. This intuitive visual representation of animal distribution works great for presentations and publications. You can view heatmaps per individual or per group and you can select the data you want to appear in your heatmap. Use time intervals or combine different periods within a trial. Then sort a series of heatmaps in such a way that you can easily compare between trials, between individuals, or between groups. You can export it for use in presentations and publications.



*A heatmap is a great way to visualize how your animal spent its time during the test. EthoVision XT offers high resolution export so that you can use these heatmaps in presentations and publications.*

#### Export

Both raw data as well as data analyzed with EthoVision XT can be exported to other programs for further analysis. Several formats are possible, such as Microsoft Excel, ANSI text, and Unicode. Graphs and heatmaps can be exported as PNG, JPEG, BMP, and GIF.

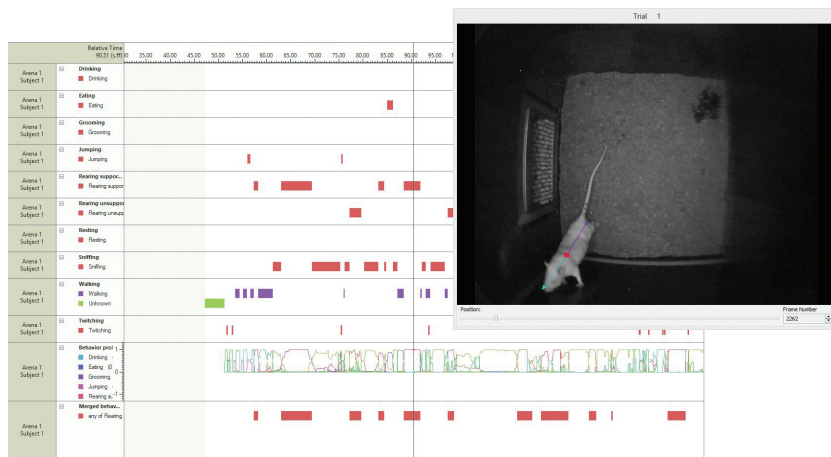
#### MODULES

EthoVision XT Base allows you to perform a wide range of tests, tracking the center point of one animal in one arena. If you need more, the modular approach of EthoVision XT grows with you and allows you to create the solution to meet your research needs. You can pick and combine the modules. For example, combine the Social Interaction Module and the Multiple Body Points Module to track the interaction between two mice in great detail or combine the Trial & Hardware Control Module and the Multiple Arenas Module to automate operant conditioning tasks.

## Automatic recognition of rat behaviors

The Rat Behavior Recognition Module automatically recognizes ten rat behaviors: grooming, jumping, supported and unsupported rearing, twitching, sniffing, walking, resting, drinking, and eating. Automating this part of your research increases the objectivity and efficiency of your research as it has a number of advantages over human observations. The system is accurate, consistent, and tireless. It will score the same behavior in the same way each time around. Especially long-term observations become much more efficient. While human observers can become tired and scoring behaviors from minutes of video can take hours, the Rat Behavior Recognition software works tirelessly and never fails you.

Rat Behavior Recognition does not require expensive hand-labeled lists of behaviors, nor does it need any previous training. It works in different set-ups, with different strains of rats, and with a practical top-view camera position. This software can also be customized to automatically recognize additional behaviors. If you are interested in this, contact us for more information. (This module only works in combination with the Multiple Body Points Module.)



The Rat Behavior Recognition Module automatically recognizes ten rat behaviors. It is a great way to increase the objectivity and efficiency of your research.

## Full automation

With the Trial & Hardware Control Module, automation takes on a new meaning for video based behavioral research. It not only allows you to connect and control external equipment (such as pellet dispensers, lights, doors, and levers) but it also allows you to use the real time behavioral and positional parameters to control them. The possibilities for your behavioral research are endless!

Similar to Trial Control, Trial & Hardware Control in EthoVision XT is an easy and straightforward tool that allows you to build complex test protocols in a quick and easy way. You do this by simply dragging predefined condition or action blocks into the flow diagram. Each condition block (such as time, location, hardware event, or behavior event) can generate a rule by connecting it to an action such as the opening of a door or counting a number of certain events. Ultimately, by connecting the blocks or individual rules in an AND/OR manner, you can realize even the most complex test protocols. Of course, the Trial and Hardware Control Module is not only suitable for relatively straightforward test protocols such as the raising of an Atlantis platform. It also allows you to control more complex behavioral paradigms such as the radial arm maze with automated doors and pellet dispensers, the 5-choice serial reaction time task, or a fear conditioning experiment, to name just a few.

*For our research, EthoVision XT is an essential tool for sophisticated analysis of behavior as it relates to neural circuit function.*

*[Garret Stuber – USA]*

The great advantage of using EthoVision XT to control your operant conditioning experiment is that you can use the automatic real-time positional and behavioral data of EthoVision XT as part of your test protocol. For instance, the 5-choice serial reaction time task requires the animal to poke its nose in a hole situated under a light within a few seconds after it is turned on. There are five lights with five holes. If the animal succeeds, a reward will be given in the feeding area. With Trial & Hardware Control, you can prevent the animal from missing the cue by assigning the condition that the animal will only receive the cue while orientated in its direction. Additionally, you can prevent the animal from sitting near the correct nose poke hole by adding a condition that he has to be more than 10 cm away from its location before the stimulus can be given again.

Trial & Hardware Control is also great when performing behavioral studies with optogenetic stimulation. You can control the stimulation with Trial & Hardware Control, based on animal behavior or timing. It also registers what happens during a trial, so you can easily analyze what occurred as a behavioral consequence of optogenetic stimulation.

## High throughput with multiple arenas

EthoVision XT's Multiple Arenas Module enables high throughput experiments, since it allows you to track in up to one hundred testing areas (arenas) simultaneously. You can easily copy and paste arena settings from one arena to the other. Trial control conditions are still applied to each arena individually. This module offers great possibilities for studies such as those performed with multiple open fields or with zebrafish larvae in a 96-well plate.

## Tracking multiple body points

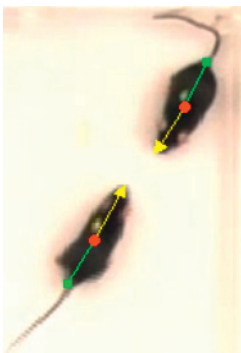
With the Multiple Body Points Module, EthoVision XT can identify the nose point and tail base of rats and mice – an ideal way to measure exploratory behavior. The proximity of the animal's nose to a certain object or the direction towards which

the animal's head is pointed are very informative parameters when studying memory in rats or mice. 'Head direction to zone' is especially useful in the novel object recognition test or any other test in which an animal's interest in an object either inside or outside the arena is investigated. Exploration of the novel object is generally defined by the animal's head being within a certain radius of the object. The 'head direction to zone' variable analyzes the degree in which the head of a rat or mouse is directed towards a point of interest.

You can also use the Multiple Body Points detection to more accurately analyze entrances into arms of a maze or other zones and define which body points should have entered the arms for it to be counted as an entry. Finally, this module is also a great addition for social interaction studies.

#### Social interaction studies

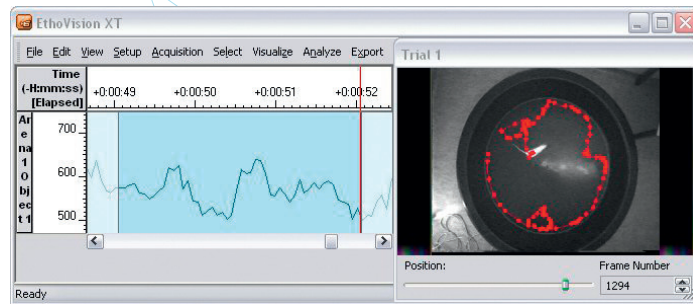
With the Social Interaction Module you can track multiple animals within one arena and study their interaction in great detail. Unlike with other solutions, the Social Interaction Module does not require color marking of animals. Of course, it is possible to track the marker instead of a body point, making it easier to identify the individual animals. A range of social parameters give you meaningful results, such as the time spent in proximity of another animal, the movement of two or more animals relative to one another, or the amount of nose to nose contact (when used in conjunction with the Multiple Body Points Module).



*The Social Interaction Module lets you study social interaction in great detail. Combine this module with the Multiple Body Points Module to extract even more information from your experiment.*

#### Exploring physiological data streams

When working with telemetry or other physiological data acquisition systems, the Physiology Integration Module allows you to synchronize and visualize these physiological data streams alongside your tracking data. EthoVision XT sends



*Use the Physiology Integration Module to integrate physiological data streams with the acquired tracking data.*

out a synchronization signal during tracking, so after acquisition you can import the physiological data and both data streams are automatically synchronized. This powerful combination of information sources can lead to a better understanding of your research results.

#### Quality Assurance

EthoVision XT's Quality Assurance Module ensures the protection of your data. Unauthorized persons cannot open the experiment and you can assign different rights to different users. For example, give full rights to the professor, but limit the options for students. This way you can be sure that your data is safe. This module also logs all changes and settings in the project, so you can always look back and see what happened. This helps in making your experiment GLP (Good Laboratory Practice) compliant (meeting 21 CFR Part 11 requirements).

#### INTEGRATED SYSTEMS

Noldus offers you completely integrated systems, including cameras, computers, and testing mazes and arenas. Additionally, PhenoTyper® and DanioVision™ systems are powered by EthoVision XT. With the Trial & Hardware Control Module and the Noldus USB-IO box, you can connect several hardware devices. In all, EthoVision XT is a great platform to build your experiment on.

#### Heartbeat Detector

EthoVision XT activity detection allows for the detection of changes in the arena, based on the differences in grey shade between the frames. Heartbeat detection is commonly measured in zebrafish larvae as they are transparent and their hearts are therefore visible. EthoVision XT detects heartbeat activity and the Heartbeat Detector, a free software program (compatible with EthoVision XT versions 9.0 and up), extracts a power spectrum from this data. The dominant frequency is detected, which is the heartbeat of the animal.

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#### MORE INFORMATION?

See page 64 for contact information.

PhenoTyper® is a complete video-based observation system that is used for a wide range of experiments with laboratory rodents. It offers the perfect test set-up for activity and open field studies, interactive home cage testing, and circadian studies.

## BENEFITS

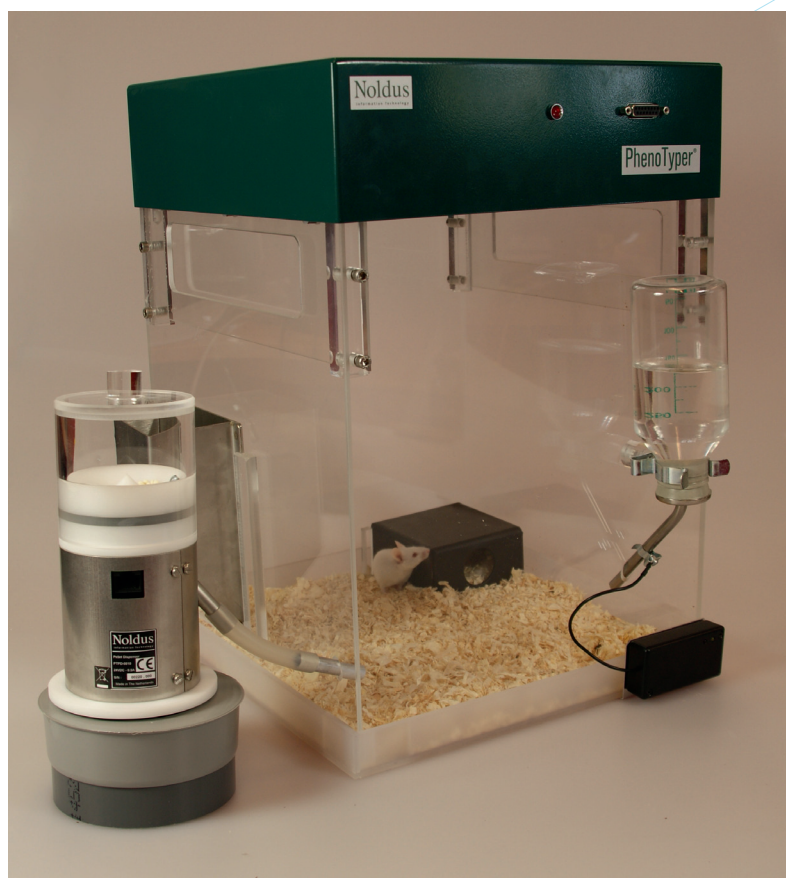
- Plug and play - the test environment and video equipment are completely integrated.
- Record video completely independent of light conditions in your laboratory.
- Standardize your experiments.
- Expand PhenoTyper with specially designed accessories and integrated visual and acoustic stimuli.

## FEATURES

PhenoTyper is a combination of a cage and a top unit with light and video sources. The walls of the cage are standard, designed to be compatible with drinking bottles, feeders, shelters, etc. Two of the walls contain ventilation holes. All the walls can be customized to fit any device you might want to add, such as nose poke devices or cage dividers. The top unit contains a camera, light sources, a light filter, and adjustable visual and acoustic stimuli. PhenoTyper provides a complete observation environment:

- The infrared (IR)-sensitive camera with IR band pass filter, and IR light sources ensure robust recording regardless of ambient light conditions in the laboratory.
- The built-in acoustic and visual stimuli can be used to elicit behavioral responses, such as anxiety-related and operant behavior.
- PhenoTyper can be adjusted to make room for any kind of external device you want to use in your behavioral protocol.

PhenoTyper is available in two versions; a basic, empty cage and a home cage equipped with a shelter and food and drink station. Several add-on sensor and stimuli devices can be added. Both versions are available in two sizes: the PT3000 (30 x 30 cm) and the PT4500 (45 x 45 cm). The size of the ventilation holes, number of bottles, and the size of the shelter differ according to the number and the type of animals that are used.



*PhenoTyper is ideal for home cage assessment studies. Combine PhenoTyper with one of our add-on products such as the Noldus lickometer or the Noldus pellet dispenser to get more out of your research.*

### Basic cage

The PhenoTyper basic cage is an empty cage suitable for conducting several tests that require an open field, such as learning and memory tests, anxiety tests, or for the recording of locomotor activity.

### Home cage

A PhenoTyper home cage is the basic cage equipped with one or two drinking bottles, a feeder, and a shelter to create an environment suitable for home cage experiments. Performing anxiety studies or operant conditioning tasks in a home cage environment helps you to refine and automate your research in a better way than with conventional tests.

### Combine with EthoVision XT

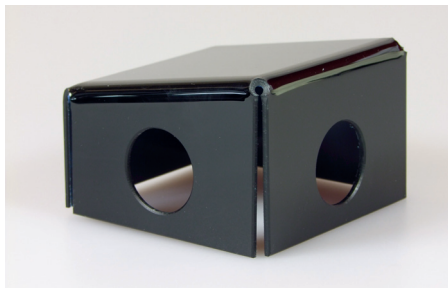
PhenoTyper is powered by EthoVision® XT, software that tracks the animal's activity, movement, and behavior in great detail. The addition of the Trial & Hardware Control Module provides the ability to set up protocols to control and receive feedback from several hardware devices (such as the accessories presented on the right). The combination of PhenoTyper and EthoVision XT allows you to run experiments for any duration, from a couple of minutes to several weeks in a row.

## ACCESSORIES

PhenoTyper can be combined with accessories such as shelters and hardware devices such as the Noldus pellet dispenser and the Noldus lickometer. You can use any TTL-based device, connect it to the Noldus USB-IO box, and fully automate this set-up with EthoVision XT Trial & Hardware Control.

### PhenoTyper IR translucent shelter

Rats and mice are nocturnal animals, so to study them during their active phase, IR lighting is often applied in laboratories. It is invisible to the animal, but behavior can be recorded using an IR sensitive camera. The PhenoTyper top unit contains a video camera and IR LED units. To observe and track animals while they are inside their shelter, this shelter can be used. Although it appears black to the naked eye, it is made from IR translucent material.



*Although it is black in appearance, this shelter is IR translucent, making it ideal for use in experiments with IR light conditions.*

### Noldus lickometer

The animal's intake of water, or certain compounds dissolved in water, is important in many research studies. However, keeping track of this manually can be time consuming and prone to mistakes. The lickometer accurately registers the drinking behavior of your animal and signals this to EthoVision XT. The software records and time stamps these drinking events and stores this data together with other data acquired during tracking. The lickometer consists of a small device with a clip to attach to the nipple of the water bottle. It measures contact between the animal and the water bottle by detecting any change in capacitance between the ground plate and the drinking nipple. No current flows through the animal, so there is no negative effect on animal health or drinking behavior.

### Noldus pellet dispenser

The pellet dispenser with pellet drop detection can be used to stimulate interactivity between an animal and its environment by rewarding specific behaviors. In combination with PhenoTyper and EthoVision XT Trial & Hardware Control, you can use it to automate learning and operant conditioning tasks. Simply program EthoVision XT to activate the pellet dispenser as soon as the user-definable conditions are met, for example when the animal is detected on top of its shelter or when a lever is pressed. Feedback from the pellet dispenser to EthoVision XT is also provided, so that the pellet dropping event is registered alongside behavioral data.

### Noldus illuminated shelter

The illuminated shelter is ideal for passive or active avoidance tasks. You can use it to assess learning and memory based on an aversive stimulus, in this case light. It is a corner shelter with two entries and lights inside. With EthoVision XT's Trial & Hardware Control you can program the interior lights to turn on when the animal enters the shelter through the (as previously determined) preferred entry side, while the lights stay off when it uses the other entry. This way you test the mouse's ability to learn and adapt its preferred entry side.

### PhenoWheel

The PhenoWheel measures the activity of the mouse in a running wheel. It can be placed inside any basic or home cage. It consists of a running wheel and a counter module. By means of a magnet and a magnetic sensor, the number of rotations is counted and sent to the EthoVision XT software. Furthermore, you can use EthoVision XT to measure the amount of time spent in the running wheel.

### Mouse Feeding Monitor

The Mouse Feeding Monitor measures the interaction between a mouse and a stainless steel feeder, measuring frequency and duration of feeding behavior. It is placed between the feeder and the PhenoTyper mouse cage wall (PT3000) and works with a beam-break mechanism. Connected to EthoVision XT Trial & Hardware Control, you can collect data from the monitor to incorporate it with your tracking data. Of course, you can also use this input for Trial & Hardware Control protocols, transforming the monitor into a nose-poke device for operant conditioning tasks.



*The Mouse Feeding Monitor registers feeding behavior.*

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#### MORE INFORMATION?

See page 64 for contact information.

DanioVision™ is the innovative system designed for the high-throughput tracking of zebrafish larvae or other very small animals. Powered by EthoVision® XT, it allows for highly accurate tracking of up to 96 animals simultaneously in multi-well plates. All in a compact and controlled environment; DanioVision is shock resistant and gives you complete control over light and dark settings, and the temperature of the water directly beneath the well plate.

## BENEFITS

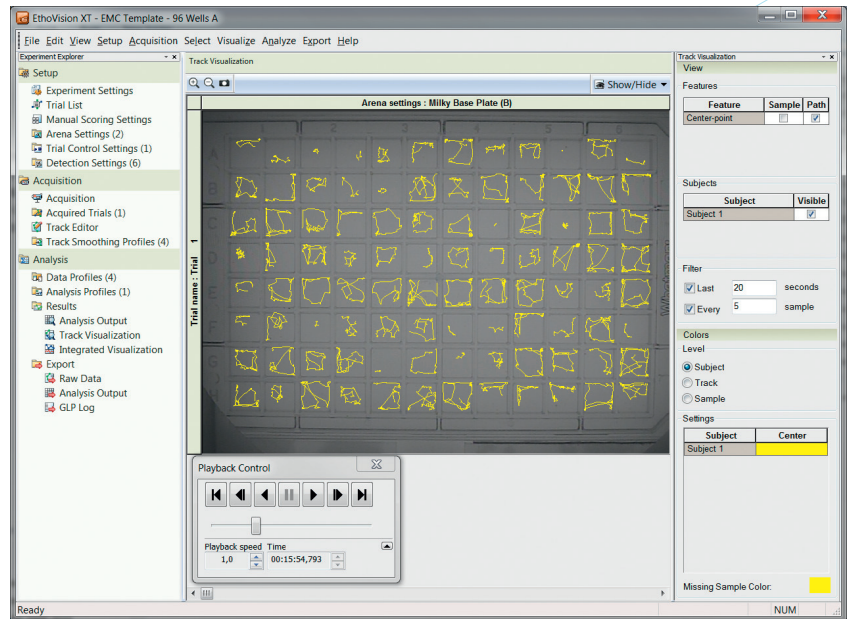
- Get robust and reliable tracking data.
- Set up your experiment easily and quickly.
- Control light and dark conditions.
- Analyze your data visually and statistically.

## FEATURES

DanioVision is a complete solution, consisting of the DanioVision Observation Chamber, the Temperature Control Unit, and EthoVision XT



The DanioVision Observation Chamber offers a compact desktop model that is easy to use and handle. The large sliding opening provides easy access.



EthoVision XT provides accurate tracking of the activity of each zebrafish larva.

pre-installed on a class-A computer. The DanioVision Observation Chamber features a compact and user-friendly design. It is small yet has everything you need; an infrared (IR) backlit holder for a multi-well plate, a high quality IR-sensitive camera, and a white light source which can be TTL-controlled to operate automatically, based on animal behavior or time. The Temperature Control Unit lets you control the temperature of the water that flows underneath the well plates, and flows through the system. DanioVision is compatible with any ANSI & SBS compliant multi-well plate. Overall, this system offers the ideal controllable environment for the tracking of activity, movement, and behavior of zebrafish larvae.

### High throughput testing made easy

DanioVision is designed as a plug-and-play system; just hook up the wiring to connect the Observation Chamber to the computer, plug in the power, and you are ready to go! The large sliding opening of the DanioVision Observation Chamber provides easy access to quickly replace the well plate between trials. The plate holder assures the wells are always positioned in the same place, so the camera and the wells stay perfectly aligned. EthoVision XT's user-guided experiment set-up with pre-installed experiment templates allows for a quick set-up of your experiment. High throughput tracking has never been this easy!

### Reliable image for tracking

To ensure a steady view, DanioVision is equipped with anti-vibration feet to absorb shocks to the image that might occur in a laboratory setting. The high quality camera and the innovative optical design of the observation chamber prevent angular distortion at the edges of the wells. Additionally, the backlit plate holder provides even lighting to each well and prevents shadowing. The combination of the IR backlight and the IR-sensitive camera makes reliable tracking in the dark possible. All these features combined guarantee you of a reliable view of each individual well.

### High quality camera

The DanioVision Observation Chamber has a built-in camera. The high resolution and high frame rate of the camera allow you to monitor movement in details. It also includes a zoom lens, allowing you to zoom in up to a level of four wells.

## Take control

The DanioVision Observation Chamber creates a controlled experimental environment for testing. It shuts out external light, and allows for control of the internal white light conditions with EthoVision XT. The white light is integrated in the backlit plate holder and can be used for long term studies on circadian rhythmicity or to induce a startle reflex when the light is turned on. Furthermore, you can adjust the white light gradually, from dimmed to bright. EthoVision XT guarantees perfect tracking under all light conditions, even when you switch from dark to light, or gradually change the light gradient during your experiment. You can choose between very low light levels or standard white light levels. The standard white light levels range from approximately 150 Lux to 4500 Lux. The low light maximum intensity value is 1 Lux. The low light settings can be used to mimic more natural situations.

## Multiple days in a row

The Temperature Control Unit lets water flow beneath the well plate at a user defined temperature. The unique design lets you either cool or heat the water, so you can accurately set the conditions for your experiment.

The unit is very compact, and easily connected to the Observation Chamber with two water tubes and two cables. When you set the desired temperature the system will start to heat or cool the water until the user-defined temperature is reached, which takes only a few minutes. The temperature of the water is measured directly at the position of the well plate, so the temperature read from the display is accurate to the temperature inside the wells.

## Additional stimuli

In addition to light control and flow-through of water, you can connect other external devices to the system. DanioVision has four TTL connections to add your own custom stimuli, such as a vibration stimulus, which can be controlled with EthoVision XT.

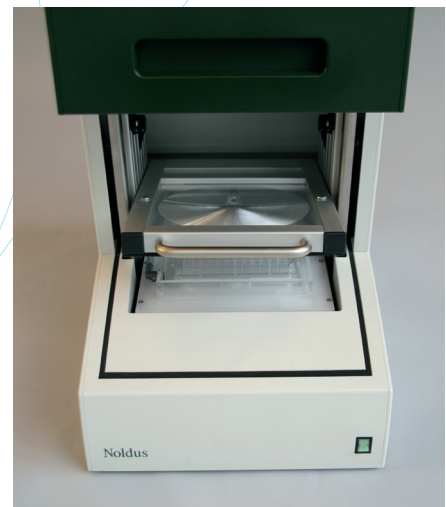


The Temperature Unit allows the flow-through of water at a user defined temperature.

## Expand the possibilities

DanioVision includes a fully functional version of EthoVision XT. This means that this software is also ready to use for other purposes, such as:

- zebrafish larvae heart rate monitoring
- zebrafish embryo activity (tail coilings) monitoring
- adult zebrafish tracking in a T-maze to study learning and memory
- multiple aquaria studies



The innovative optical design assures a stable and distortion free image of each individual well.

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### MORE INFORMATION?

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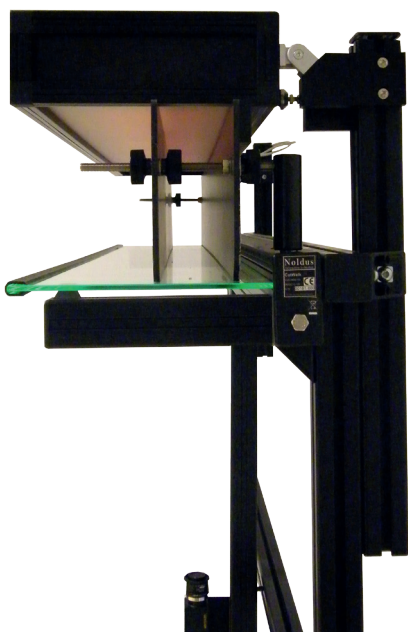


CatWalk™ XT is the quickest way to assess locomotor deficits and pain-induced gait adaptations in voluntarily walking rodents. Consisting of both software and hardware components, CatWalk XT can be used for any rodent model with defects to the CNS, PNS, muscular system, or skeletal system, and has been validated in research on spinal cord injury, neuropathic pain, arthritis, stroke, Parkinson's disease, ataxia, brain traumatic injury, and peripheral nerve injury.

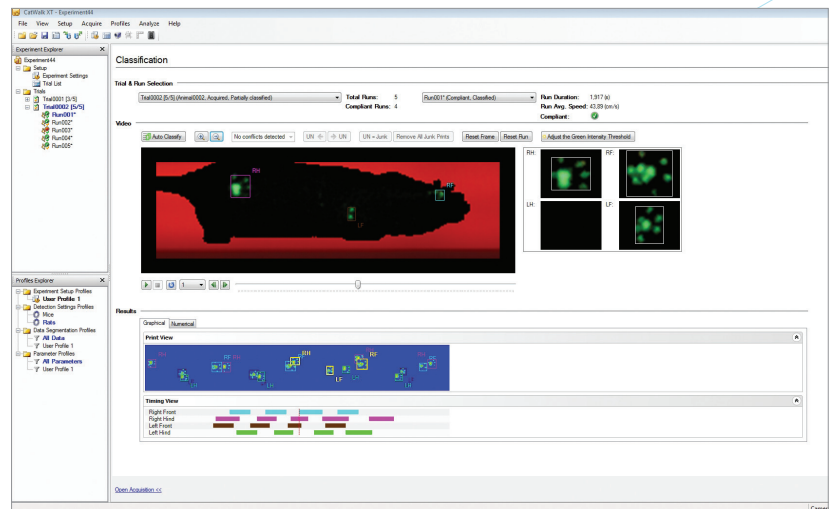
CatWalk XT objectively measures various dynamic aspects of animal locomotion and footprints. Unlike other methods, CatWalk XT allows you to assess the temporal dimension of gait, at a rate of one hundred times per second! This timing information, combined with the position, and surface area of each footfall, enables the calculation of numerous parameters. You can perform a detailed quantitative and qualitative evaluation of rodent locomotor performance.

## BENEFITS

- Benefit from a complete and easy-to-use turn-key system for rodent gait analysis.
- Collect, analyze, and store the most accurate gait data.
- Assess gait and locomotion behavior in an unforced and low stress manner.



The CatWalk XT walkway; a corridor with glass plate, light source, and camera to accurately record footprints.



CatWalk XT accurately records footprints and classification is easy! CatWalk XT can even do this automatically with the Automatic Footprint Classification Module. With a wide range of parameters to choose from, CatWalk XT helps you to get the most out of your experiment.

- Easily compare treatment groups and/or time points.
- Capture the real footprints of rodents.
- Use a product that is under constant development in collaboration with the scientific community.

## FEATURES

### All in one

CatWalk XT is a complete system: a test apparatus and analysis tool in one. The walkway consists of a glass plate, corridor, light source, and mobile frame. It incorporates Illuminated Footprints™ technology to assure real footfall assessment. The computerized high speed processing of footprints from video results in highly detailed, reliable, and retraceable data. No other method is a match for CatWalk XT!

### Voluntary movement

The CatWalk XT method is based on a non-invasive and low stress manner of testing. The recording of footprints on video occurs while the rat or mouse voluntarily moves across the walkway, unlike systems that use treadmills or running wheels. This way, a natural gait is evoked; there is no forced movement as a confounding factor of gait.

To make it easy to train your animal, and to motivate it to cross the walkway in one consistent run during the experiment, CatWalk XT includes a goal box. Mounted at one end of the walkway, this goal box consists of a black shelter and the animals own home cage accessible through a hole in the shelter floor.

The goal box helps you to get consistent runs easier and faster – animals are less likely to turn around or stop along the way, motivated by the desire to go to the safety of familiar surroundings. This enhances the quality of your data. Additionally, several filters in the software are available to assure high quality data with low variability.

## Illuminated Footprints

While the animal traverses the walkway, the Illuminated Footprints technology ensures an accurate distinction between the parts of the animal that touch the walkway, and parts that do not. Light is sent through the glass walkway while the animal walks over it. Only at those areas where the animal makes contact with the glass plate, light is able to escape.

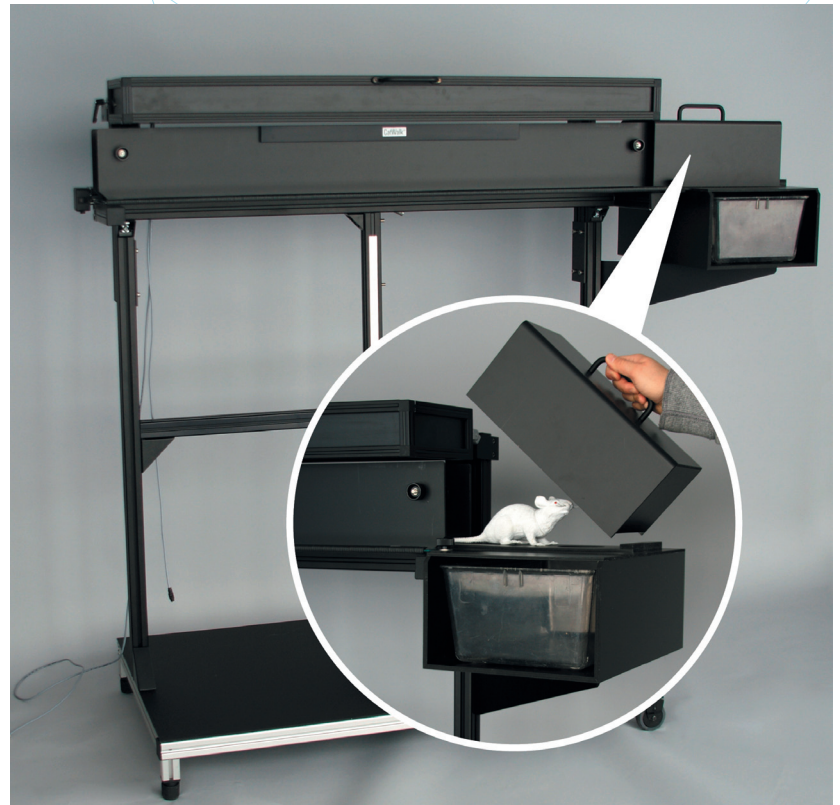
The light reflected by the body parts touching the glass is recorded with a high speed camera, positioned underneath the walkway, sending data to a computer running the CatWalk XT software. The intensity of this green light is adjustable from within the software. This is especially useful when you are using extremely heavy, very young, or severely impaired animals. This technology allows for assessment of body weight distribution across the paw during locomotion, which is represented in a dynamic 3D graph.

## Red light conditions

Red light is used by the software to visualize the animal's body contour and is different from the light in the glass runway. That means that you can work under red light conditions, instead of in complete darkness. The body contour lighting facilitates (automatic) classification of footprints and other contact areas. The intensity of the red light is also adjustable from within the software.

## Set up and preselect

You can set up and plan your experiment by defining time points, treatment groups, run criteria, and trial lists. You can then save this as a profile and re-use it in later experiments, saving you time and preventing errors. Since walking speed is an important factor affecting gait parameters, CatWalk XT will only use those sections of the runs that adhere to predefined criteria. This will



*The complete instrument: the walkway consists of a corridor with a glass plate bottom with Illuminated Footprints technology: light shines through to reveal each footprint. This is captured with a high speed camera positioned below the walkway. The roof provides red light, for practical working conditions. The goal box provides an easy training tool and motivates your animals to cross in one consistent run, leading to better data.*

not only compensate for speed differences, it will also give you higher quality data. Thresholds can also be adjusted after data collected.

## Footprint classification / Automatic Footprint Classification

After data acquisition, all footprints need to be classified. With CatWalk XT this is easy to do: the body contour lighting makes it easy to see which print belongs to which paw, and where one footprint ends and the next one begins. Or, to make it even easier, Automatic Footprint Classification™ eliminates the need to classify each footprint manually. At the push of a button, all the footprints in a run are automatically classified.



*The run video (left) and a dynamic representation of the de combined image of each current footfall (right).*

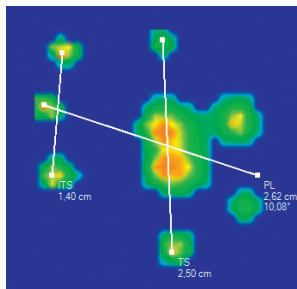
## Classification in detail

In some instances, for example with severely impaired animals, classification might be difficult. CatWalk XT automatically detects classification conflicts and lists them in a drop-down box. You can also zoom into the run video, up to four times, for a detailed look at each print.

## Interactive Footprint

### Measurements

The Interactive Footprint Measurements™ Module allows you to calculate the distance between the toes of each paw, the paw print length, and its angle relative to the body axis and movement vector. Additionally, the Sciatic Functional Index, Tibial Functional Index and Peritoneal Functional Index are calculated, allowing you to assess the recovery of sciatic nerve functioning in rats and mice.



The Interactive Footprint Measurements Module allows you to measure toe spread, intermediate toe spread, and print length.

## Data Segmentation Profiles

To further enhance the quality of your data, you can fine-tune the selected data with Data Segmentation Profiles before analysis. The result is a selection of runs or partial runs that comply with your criteria, which you can then subject to analysis.

## Numerical and graphical output

After the runs are acquired, the footprints are classified, and data is selected, CatWalk XT automatically generates numerical and graphical outputs. Parameter charts provide you with graphs for every parameter you have selected in your profile. In one view, you can see how gait changes over time or differs between treatment groups. All parameters (explained below) can be exported to statistical packages for further analysis. You can also export the Run Video. Graphs can be exported to software programs such as PowerPoint or as a PDF file.

## PARAMETERS

### Parameters related to individual footprints

Besides footprint dimensions, CatWalk XT measures the stance and swing phase durations and the brake-propulsion phase ratio which is determined by the change in footprint area during the stance

**Video**

Run3 1.82 (184/376)

1/5

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**Visualizations**

3D Print Intensities
2D Print Intensities
Footfall Patterns

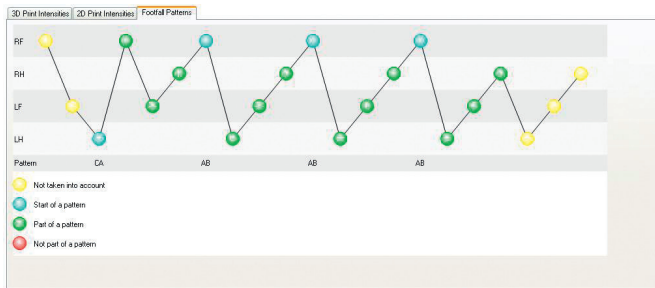
Left Front

Left Hind

Right Front

Right Hind

Graphical representation of paw weight distribution of each individual footfall.



Footfall patterns show the order in which paws were placed and if they were part of a detected step cycle.

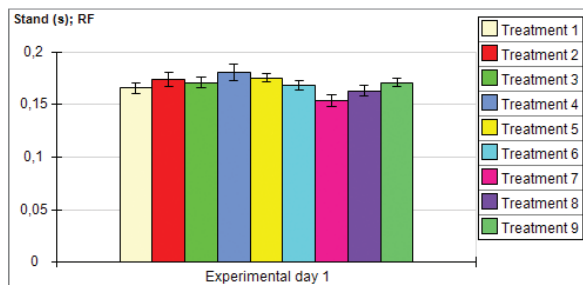
phase. Due to a relationship between the footprints and the pressure exerted by each paw, CatWalk XT is able to assess the distribution of weight support across each one of the four paws. An animal with, for example, an inflamed knee joint will likely avoid supporting too much weight with this particular limb. Values are also expressed as ratios between contralateral paws in order to correct for body weight differences between different animals.

#### Parameters related to the relative positions of footprints

CatWalk XT measures the distance between consecutively placed footfalls (stride length) and the distance between contralateral footprints (base of support) and ipsilateral footprints.

#### Parameters related to time-based relationship between footprints

CatWalk XT provides time-based relationships between footfalls. It measures the sequence of the steps taken by the four paws and determines whether steps belong to regular sequences or not. An index is calculated for the degree in which steps belong to regular sequences. This index is regarded as an objective measurement of interlimb coordination. Besides this measurement of ordinal scale, CatWalk XT also provides parameters related to phase lags: the timing of a step is expressed as a percentage of the stride duration of another step. Measurements are also provided on the relative duration of simultaneous contact with the ground for different paw combinations. For example, recent additions are single stance, initial dual stance, terminal dual stance. They are used in research to determine how much time the animal spent on one or both of his hind legs.



Parameter charts show you how each parameter of interest changes over time or differs between treatment groups.

#### Parameters related to toe spread and paw angle

CatWalk XT provides parameters on toe spread, intermediate toe spread, print length, and paw angle. Paw angle can be measured as the angle between the paw axis and the body axis or between the paw axis and the movement vector. Additionally, toe spread and print length are used to calculate Sciatic Functional Index, Tibial Functional Index, and Peritoneal Functional Index.

#### Other parameters

CatWalk XT provides many other parameters that give valuable information about the locomotor activity of your animal, such as cadence and contact duration of body parts other than the paws.

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# PRODUCTS

## THE OBSERVER XT

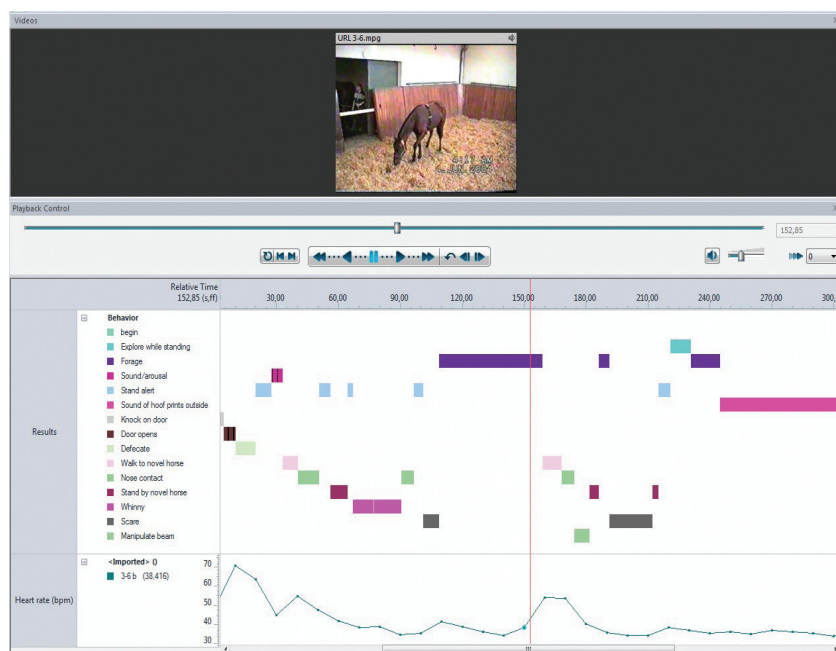
The Observer® XT is the world standard for behavioral coding and analysis software. With a twenty year track record and cited in hundreds of scientific publications, it is an invaluable research tool for a wide variety of disciplines. It combines proven concepts with cutting edge technology to help you make the most of your research. It helps you to get ahead and stay ahead.

Experience the power and flexibility in each phase of your research. Rooted in manual event recording, The Observer XT contains all the essentials for behavioral research: coding scheme (ethogram) building, data entry, data management, statistical analysis, and reliability analysis. All can be applied in various settings: live in the field, from video, and in combination with physiological data recording. The Observer XT turns raw behavioral codes into meaningful information, whereas other packages leave the translation to you. And best of all: it is easy to use.

We can tailor both the software and hardware configurations to fit your needs and budget. Applications cover anything from straightforward, small-scale studies to complex experiments with hundreds of replicates. From single-user set-ups to teams with dozens of members, and from live observations on a handheld computer to integrated lab set-ups. Over time, The Observer XT grows with you, allowing you to start small and add extra modules or hardware when you need to. There is always an Observer XT that suits your needs.

### BENEFITS

- Gather rich and meaningful data.
- Work with an intuitive and easy to use program.
- Record time automatically.
- Integrate video and physiology in behavioral studies.
- Filter relevant selections of data.
- Analyze groups of observations at once.
- Calculate statistics, assess reliability, and create transition matrices.



With The Observer XT you score behaviors, integrate physiological data, and visualize and analyze it all together.

*Using The Observer I am only limited by my imagination.  
[Richard Parker – New Zealand]*

- Make clips of parts of the video & data that are interesting to you.
- Combine continuous and instantaneous sampling.
- Search through your data quickly.
- Score in your language: compatible with Chinese, Japanese, and Cyrillic characters.
- Work as a team on one project, using cost-effective Coder Licenses.
- Benefit from the flexibility of Pocket Observer for handheld computers, tablets, and smart-phones.

### FEATURES

#### Set up hardware

The Observer XT is designed in a way that allows you to set up your system with minimal effort. Video recording equipment, data acquisition systems, and other equipment and software can be easily synchronized. It is possible to automate the recordings of various types of data (such as physiological) along with the scoring of the behaviors. With The Observer XT at the core of your lab, you have a true integration platform for multimodal research.

#### Design a coding scheme

Designing a coding scheme (ethogram) is a crucial step in behavioral research - it is the actual measuring instrument that you use to gather data. Choices made at this stage determine what you can and cannot do with your data at later stages. The coding scheme in Observer XT has a powerful syntax that allows you to accurately describe complex phenomena in a few keystrokes. Special attention is given to social interactions, group processes, and other complex behaviors. You can record them with a minimum of different codes, minimizing learning efforts and errors. It is also possible to use Japanese, Chinese, and Cyrillic (Russian) characters in your coding scheme and adding and changing codes is always possible, even while observing.

#### Score behavior

Scoring behavior is the bulk of the work in most studies. The Observer XT is designed to reduce that amount of work and make behavioral coding

an efficient and easy task. Behavior is recorded by typing shortcut key codes, allowing you to keep your eyes on what you are observing while coding at great speed. You can also score with a click of the mouse. The time of each event is recorded automatically. The Observer XT checks for errors in your event log and corrects them automatically.

### Continuous and instantaneous sampling

In The Observer XT you can use both continuous and instantaneous (time) sampling. When using instantaneous sampling, the program signals you with a beep at pre-set intervals, telling you to score the behavior at that point in time. It is easy to do and reduces the work-load. Furthermore, it is ideal in studies on individuals within a group, especially in live situations. You can even combine instantaneous sampling with continuous sampling. For example, focus on a specific group member and score that individual's behavior continuously while also monitoring the other group members and scoring their behaviors at set intervals.

### Work with media

The use of video and audio adds great flexibility to behavior studies. It allows you to make detailed observations and frame accurate descriptions of fast moving phenomena, play back and review details, or ask someone for a second opinion. The Observer XT allows you to integrate a virtual unlimited amount of video and is fully equipped with integrated video recording and playback functions that make it easy to position the video, play it back at different speeds, or play it frame by frame. All data plays in sync: when moving through the data, the video follows and vice versa. After the observation, you can easily create a video highlights clip (for feedback or presentation purposes) by using the episode selection.

*The Observer has allowed me to collect data and calculate results that I could otherwise not have done - it is of primary importance in my behavioral research.*

*[Jenni Mueller - USA]*

### Media Recorder

With The Observer XT you can combine up to six video streams in your observation. It is also compatible with our new Media Recorder. This software tool combines up to six different video signals from a range of different cameras. The

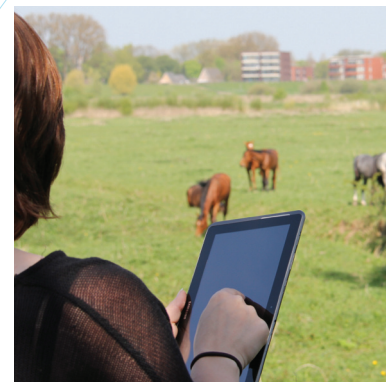
video files can be stored separately, or combined into one video stream. It is a perfect addition to your The Observer XT solution if you are scoring from video files.

### Integration external data

Overt behavior only tells part of the story; physiological responses and other external data can give important additional information. You can think of heart rate, body temperature, blood pressure (such as used in telemetry) or environmental data such as temperature and humidity. With The Observer XT you can study their correlation with or influence on behavior. Files from data acquisition systems are visualized along with the video, revealing the animal's inner world. The Observer XT even allows for the analysis of these data in combination with behavioral data. Synchronization is guaranteed by a continuous sync signal sent from The Observer XT, making the system immune to clock differences, drift, and missing samples.

### Pocket Observer

For ambulatory and outdoor observations we have developed Pocket Observer. It is a special add-on for live coding that runs on handheld computers and on rugged devices that are suitable for outdoor use. Even in hostile environments, such as tropical rainforests and deserts, you can count on Pocket Observer. The interface of Pocket Observer is especially designed for live behavioral scoring. And just like with The Observer XT, you can add behaviors while you are observing and score continuously as well as instantaneously (at set intervals).



*Pocket Observer adds great flexibility to your research. Ideal for outdoor and ambulatory use.*

### Coder Licenses

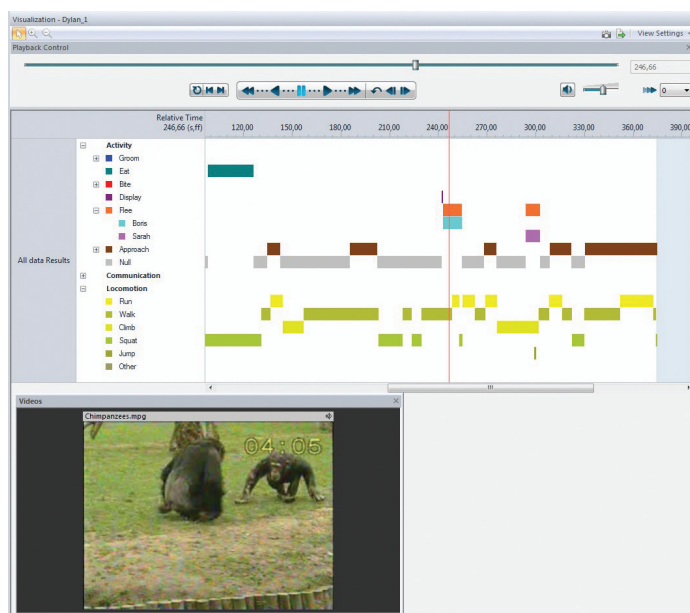
The Observer XT contains many unique features that make it ideal for collaborative and student projects. Coding schemes and observations can be exchanged between projects and workstations. The study supervisor can build a master project using The Observer XT while students can use The Observer XT Coder Licenses to score behavior. After all observations are completed, the supervisor can import all data back into the master project for joint analysis. Coder Licenses limit the use of the program to scoring behaviors and visualization only. With a Coder License, you can also create an easy-to-use and cost effective coding unit for live observations.

### Analyze reliability

In collaborative projects, it is vital to avoid observer bias. That is why The Observer XT also performs a reliability analysis: the software compares observations by different observers record by record, and reports Cohen's Kappa along with a listing of agreements and disagreements. Click on an agreement or disagreement, and the software will take you to exactly that point in the video file. Organized and color-coded in a cross-table, you can see the significant disagreements in one blink of an eye. You can also use the reliability analysis for intra-rater reliability as a basic quality check.

### Manage data

The Observer XT's data is organized in projects consisting of a coding scheme, observational data, independent variables, data filters, and analysis results. The software ensures that all data in a project is kept consistent. Use the independent variables for labeling: treatment, animal ID, observer, and other important circumstances.



The intuitive user interface of The Observer XT shows you the behaviors and the video in sync.

## Find data

The advanced find functionality will help you quickly find what you are looking for. You can use it to find comments, subject, behaviors, or modifiers. Export a list of the results to Microsoft Excel or click on the event of interest and The Observer XT leads you straight to it.

## Select data

All data in the project is available for analysis at all times. A sophisticated data selection function makes it possible to extract only the relevant bits for each research question. You can build elaborate filters based on combinations of independent variables, behaviors, physiological data, and time criteria, such as behaviors being active. Hundreds of observations can be analyzed at once, saving time and effort.

## Visualize data

The analysis of data often begins with visualizing the event log. The track of events is visualized as a horizontal bar in which different colors represent different active states. This way you immediately get a feel for the structure of the behavior you have observed. When recorded, video and physiology data are displayed alongside and all play in sync. The direct reference between video and data is a great tool for quality improvement: coding errors are shown instantly and can be corrected immediately. You can make a snapshot of this visualized data for presentation.

## Analyze data

The Observer XT gives you powerful tools to perform in-depth analysis over all the observations in your project simultaneously, filter on subjects and/or behaviors within those observations, and make comparisons as you wish. You can also integrate the analysis of behavioral data and physiological data, giving you insight into the animal's inner world and behavioral structures. It offers descriptive statistics and lag sequential analysis to analyze the order of events. Among the possible outputs are tables of frequencies, durations and other statistics, interaction matrices, and transition matrices. Synchrony and learning curves are also analyzed. These results can be split up in intervals and the layout of the results is completely customizable to the requirements of the receiving software packages. You can also perform latency analysis.

## Explore and present data

The Observer XT allows you to create pie charts, scatter plots (with trendlines), and other visual representations of your results. You can easily use these illustrations for PowerPoint presentations or research articles. You can also make video highlight clips. The improved episode selection allows you to create an overview of interesting elements of your study. For example, create an overview of biting incidents or play behavior, or show parts of the video in which the heart rate of the subject was above a certain level.

## Export and import data

The Observer XT is an open system, allowing you to import event data from many different systems and to export behavioral as well as physiological or other external data streams in Microsoft Excel, text, or XML format for use in other systems, such as statistical packages. Data from The Observer XT can also be used in Theme™.

The 'Codes' window shows a table with columns for 'Subjects', 'Behaviors', and 'Modifiers'. The 'Behaviors' column is expanded to show a list of activities and their corresponding codes.

Activity	Behavior	Modifier
Play	p	
Groom	g	
Eat	e	
Kiss	k	
Hit	h	
Bite	b	
Display	d	
Look for	l	
Flee	f	
Approach	a	
Mount	m	
Null	* Subject *	n

Share your coding scheme online!

## Re-use and share your projects and coding schemes

The Observer XT allows you to save a template of your project. In this template you can save your coding scheme, independent variables, and hardware settings. Using templates benefits you in three ways:

1. You can save and lock your coding schemes for other that participate in your research by scoring behaviors. You can create a template with a coding scheme that several of your students or colleagues use. A practical solution in combination with Coder Licenses – you can set up a lab with multiple coding stations.
2. As a lab manager, it is convenient to define your hardware settings and re-use them everytime someone opens the template.

- Saving your coding scheme in your template allows you to share it with others. There is a free online exchange functionality through which you can share and download coding schemes from others. Once a template coding scheme has been downloaded, information about who set-up the coding scheme allows you to contact that person directly.

### Develop your own add-ons

A Software Development Kit (SDK) is available for developers who want to build their own modules or interfaces with other systems. For example, The Observer XT contains a mechanism for executing other (external) applications during certain actions taken by the user in The Observer XT. One of these actions is 'start observation'; you can command an external application of your choice, for example a light switch, to react to this action. Another example is a plug-in which offers the possibility to obtain event data from an external program while you carry out a live observation in The Observer XT. The external events, such as presses of a button, are imported simultaneously with your manually scored data in The Observer XT.

### MODULES

The basic The Observer XT system offers a complete solution for live coding and data analysis. It can be extended with up to six modules:

- *Advanced Analysis Module* – Allows you to perform reliability analysis and lag sequential analysis.
- *Media Module* – Allows for recording and playback of two video sources and creation of video highlights.
- *Multiple Media Module* – Allows you to play up to twenty videos.
- *External Data Module* – Synchronizes concurrent acquired data of external data acquisition equipment.
- *Software Development Kit (SDK)* – Helps you develop your own add-ons and interfaces.

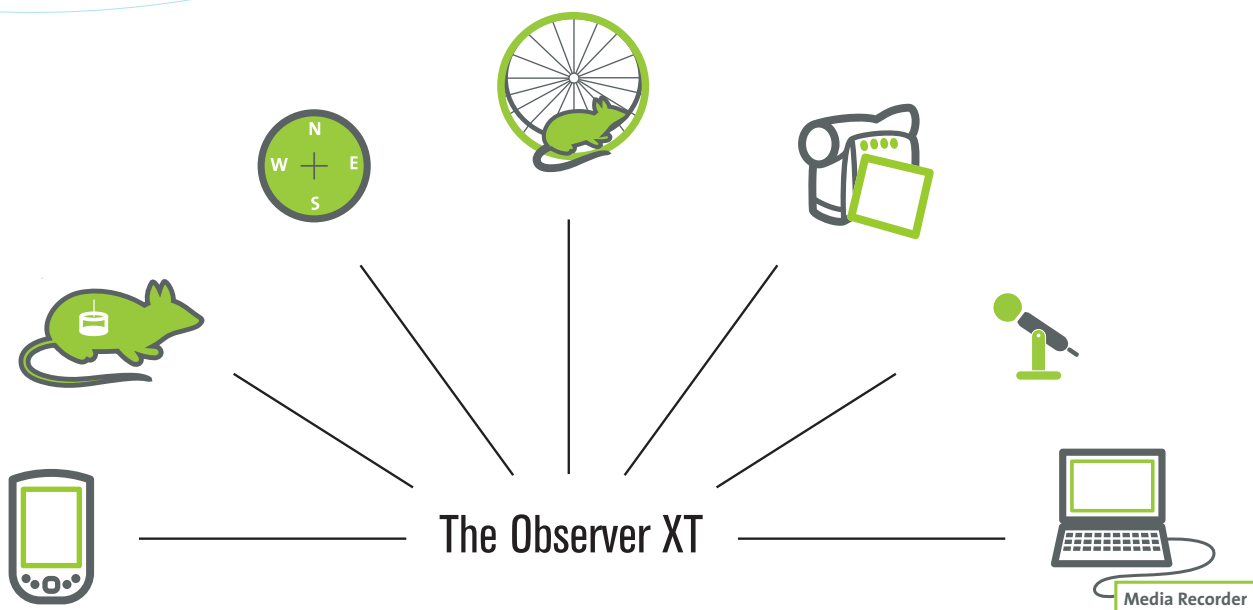
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#### MORE INFORMATION?

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*The Observer XT can integrate and synchronize data from many different sources.*



Theme™ detects statistically significant time patterns in sequences of behaviors. These so called T-patterns are based on the timing of events, relative to each other. This can give striking new insights into the structure of behavior that cannot be found with the naked eye or with any other method.

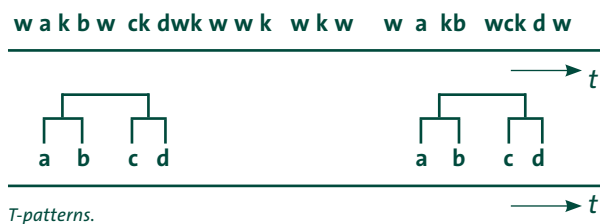
## BENEFITS

- Get new and unexpected insights into your research.
- Detect subtle differences in behavior that other methods cannot detect.
- Experience more power than with other sequential analysis methods.
- Use a program that is sensitive to patterns, though insensitive to random variation.
- Unravel the time structure of behavior at any level of detail.
- Analyze raw behavioral data – little or no data pre-processing and post-processing necessary.
- Get quantitative results suitable for statistical analysis.

Scientists have been conducting research with Theme for over twenty years, and Theme has been successfully used in a wide variety of disciplines. Use it in conjunction with any of the solutions described in this catalog, or as a stand-alone package. Theme was developed by PatternVision Ltd. (Reykjavik, Iceland).

## T-PATTERNS

Timing and order are crucial to the effectiveness of nearly any kind of action, but they are often hard to capture in statistics. Theme is a software package that was especially developed to deal with this challenge. If two behaviors are linked by a certain time interval more often than expected by chance, Theme defines them as a T-pattern. This T-pattern analysis gives new and unexpected insights into the structure of behavior.



### Well-established model

Theme is based on a well-established mathematical model. Due to this model Theme can detect much more structure than other methods (series of 20-30 events are no exception, where most methods stop at 3-5). The basis of Theme is a statistical test that finds significant time intervals between two series of events. The dyads found are tested against other events and dyads, and new connections are made. This is repeated until no new relationships are found. A special algorithm eliminates duplicate and incomplete patterns.

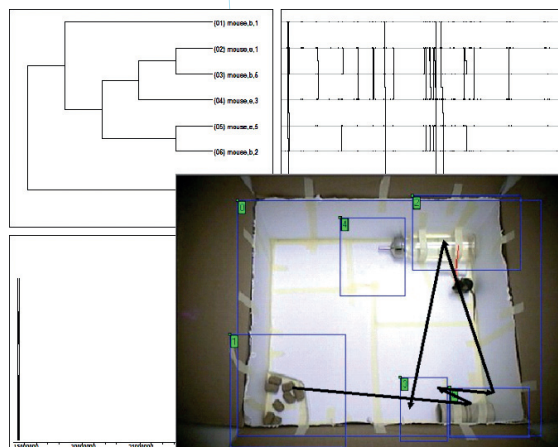
In other words, Theme describes behavior in terms of time relationships between activities.

### Social interactions

Theme is especially effective in the analysis of social interactions. Social behavior is highly organized in time, but can also be quite variable. Contrary to other methods, Theme can detect and quantify the overall time structure in behavioral data without being distracted by the variation in details.

### Robust

The results found by Theme are very robust. The probability of long T-patterns occurring by chance is extremely low in most data. Theme performs checks against chance effects. A rigorous randomization function checks which proportion of the patterns can be explained by chance. In most data that is a small subset of the shorter patterns.



Theme shows you how the mouse follows a certain pattern, while moving around in its cage.

## FEATURES

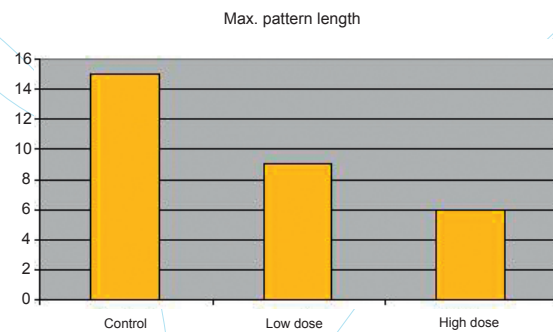
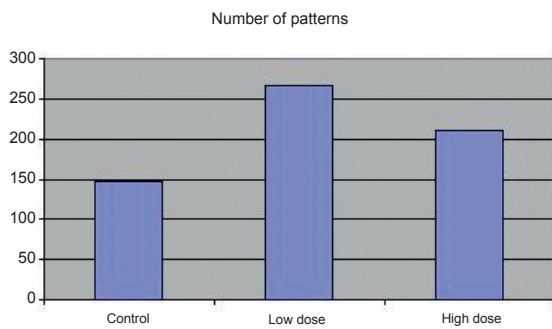
Theme can import, filter, and pre-process data, and detect patterns by objective statistical criteria. The resulting pattern sets can be displayed, searched, and analyzed in a number of ways. Pattern statistics can be exported to statistical software packages for further analysis.

### Import data and detect patterns

Theme works well on most raw behavioral data. It has built-in pre-processing options for filtering and reorganizing the data so data can be imported easily. When you import data, the pattern detection engine can be tuned to the desired level of detail, sensitivity, types of pattern, and calculation time. Pattern detection works best on continuously scored events, such as the data produced by The Observer® XT.

### PatternVision Data Exchange Program (DEP)

With the PatternVision DEP, an accurate conversion of data from The Observer XT to Theme for extensive analysis has become much easier. The DEP is a simple and straightforward program that converts exported files from The Observer XT (ODX files) to text files that



*Theme finds differences in the frequencies and lengths of patterns.*

Theme can then import. The DEP and manual are available for free to Theme users on the Theme download section of the website.

### Search and filter the detected patterns

The detected patterns can be searched and filtered in a number of ways, allowing you to focus on important details. There are simple criteria such as behaviors, pattern length, pattern frequency, and number of actors involved in patterns. There are also advanced criteria based on the relationships between patterns and the underlying event data. Criteria can be freely combined and the results can be stored for later use.

### Presentation of patterns

The overall structure of the behavior is presented in a matrix of linked event types. An overview of the position of event types in patterns gives an impression of their relative importance. At the lowest level of detail, individual patterns can be displayed on a timeline and the associated video fragments can be played to see the pattern unfold. You can use this feature for presentations and conferences. Theme gives all the details for each pattern: exact times for each occurrence, significance, and various other statistics. For behaviors with a spatial element like visiting different areas of the cage, Theme can show a path graph.



*Use Theme to unravel patterns in social interaction.*

### Perform statistical tests and export data

Theme provides a full range of descriptive statistics per input file, such as number of patterns, length, and diversity. These statistics are measures of overall structure which can be more sensitive to the effect of experimental treatment than frequency and duration based statistics. The statistics can be exported as a table to statistical packages, with their independent variables.

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#### MORE INFORMATION?

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The Tube Test is a well-known test paradigm designed to measure (altered) social dominance and investigate social hierarchies in mice. The basic principle is that if two mice encounter each other and there is no room to pass each other, the dominant mouse will be able to proceed and the subordinate mouse will back up. In other words, the dominant of the two is determined. This test has been used for decades and is well-validated. The Automated Tube Test is a complete system which fully automates this test.

### BENEFITS

- Automatic measurement of relevant parameters.
- Objective and reliable data.
- Limited human intervention required.
- Minimal chance of animals injuring each other.
- Plug and play solution: no additional data acquisition components required.
- Guidance in setting up experiments and analyzing data.

### FEATURES

The Automated Tube Test automates all steps in the test procedure. The equipment – consisting of a tube, two start boxes, transparent doors, air valves, and infrared LED sensors – allows mice to pass through the tube comfortably (without being able to pass each other), while their locations are monitored. The software provides control of the hardware components, continuous collection of the location of the mice, and detailed data analysis. Parameters that the software provides include:

- the identity of the winning mouse
- the duration needed for the winning mouse to push the other mouse back
- time elapsed until the central door opened and the match started
- time elapsed until the mice are first detected in the tube
- activation or non-activation of the air valves to release a puff of pressurized air
- data and start time of a match or training
- if a closed match concerned a normal or forced match

### Better than manual observation

Traditionally, data is collected by human observers. Now there is a way to fully automate this test

with the Automated Tube Test. This system is a combination of software and equipment, and offers several advantages over manual testing. First, manual test procedures may lead to inter-experimenter differences, while the Automated Tube Test is automated, resulting in objective, reliable, and reproducible data. Visual observation may also be a labor-intensive task, but the Automated Tube Test requires limited human intervention. This means you can perform high throughput measurement of social dominance behavior. Lastly, manual registration of the identities and performance of all mice is cumbersome – these variables are registered and stored in the Automated Tube Test software.

### How it works

The test procedures are rather straightforward. Social dominance relationships and social hierarchies are usually investigated by the following sequence of procedures:

1. Training sessions – mice are made familiar with the tube.
2. Match sessions – two mice are placed in their own start box, walk through the tube, and compete to force the other back into its start box.
3. The number of winning matches is counted for each mouse individually.
4. Social hierarchy within the experimental group is determined by the number of winning matches per mouse.

The user-friendly Automated Tube Test software provides an easy and efficient platform to set-up experiments and data analysis protocols. Data can be easily exported to your preferred statistical analysis software package.

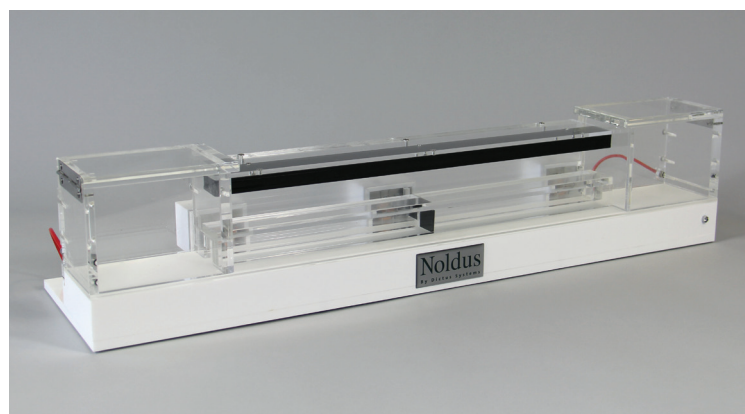
### Easy to use

The complete tube can be tilted in between tests in order to conveniently clean the walking surface. Platforms in the start boxes provide an easy way to lift the animals out of the apparatus when a training session or match has ended. The Automated Tube Test requires minimal set-up time since no additional data acquisition components are needed.

### Safe testing

Social dominance measurements are prone to aggressive interventions between competitors, potentially leading to injuries. The dimensions of the robust Automated Tube Test limit aggressive behaviors during testing and do not allow competitors to injure each other.

*The Automated Tube Test has been developed by Dictus Systems. Noldus is the worldwide exclusive distributor of the Automated Tube Test.*



*The Automated Tube Test apparatus.*

The Coy Mechanical Conflict-Avoidance System (MCS) provides an operant method of pain testing for rodents. It complements methods which rely on the pain withdrawal reflex by addressing both cognitive and motivational processing. In this method, rodents are placed on one side of the apparatus and motivated to cross to the other side. To do so, they have to cross an array of blunt tapered probes.

## BENEFITS

- Easy to disassemble/assemble for transport and cleaning.
- Compact enough to allow multiple units in one lab.
- Animal training is fast and simple.
- Testing is faster than other operant methods.
- Red color enables researcher observation while rats perceive it as black/dark.



*The apparatus is practical: compact and easy to clean and assemble. The red color allows researchers to see inside, but provides a dark environment for the animal.*

## FEATURES

### A novel test

The Coy MCS – Harte, Morrow Method is an instrument that can be used to measure the degree of sensitivity to pain. It is a novel operant approach for preclinical pain research developed by scientists at the University of Michigan, USA. It uses the innate aversion to light (photophobia) that rodents have and complements reflexive methods, such as the Von Frey assay or thermal assays.

### The cognitive and motivational component of pain

The great advantage of this test is that it measures the cognitive and motivational component of pain, because animals can weigh their discomfort in the light against their discomfort walking across the probes and make a choice. Since you can vary the probes in height and measure both time on the bed and number of complete crossings, you have information about the amount of motivation and pain (from nociception to actual pain) the animal experiences.

### How it works

Rodents are placed on one side of the apparatus in an aversive lighted area. They are given the opportunity to cross the array to escape from this area to a preferred dark area. The array exists of height-adjustable nociceptive probes, which can be lowered down completely for training sessions. The probes are blunt tapered; they are painful for the rodent to walk on but not sharp enough to cause any tissue damage.

### Practical system

The apparatus is constructed from durable acrylic, and is compact, easy to clean, assemble, and disassemble. The red color of the apparatus allows researchers to observe the behavior of the animal inside while the animal perceives it as a dark environment.

### Stimuli used

This method works by using aversive stimulus (light) and rewarding stimulus (dark chamber) to motivate the animal to cross the probes. It is adaptable to other aversive or rewarding stimuli, such as a loud noise or food reward respectively.

### Examples of research

Lau *et al.* (2012) created a rat model for neuropathic pain by inducing a unilateral Chronic Constriction Injury (CCI) of the sciatic nerve. These rats and a healthy control group underwent MCS testing with tapered probes of varying heights presented in pseudo-random order. Results show a significant stimulus-response relationship between probe height and the latency in which rats exit the light chamber.

### Measure responses

Using various pain models, variables of interest might be:

- number of complete crosses
- time to exit the light chamber (latency)
- time to cross the probes

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#### MORE INFORMATION?

See page 64 for contact information.

The fear response is quickly learned and long remembered by rodents. It is therefore a powerful and robust behavior to use for investigating memory and fear in laboratory rodents. The fear responses most often measured in fear studies are freezing (watchful immobility) and the startle reflex. The fear conditioning setup from Noldus includes all the components for performing experiments with EthoVision® XT (see page 14), based on the paradigms: contextual fear conditioning and cued fear conditioning.

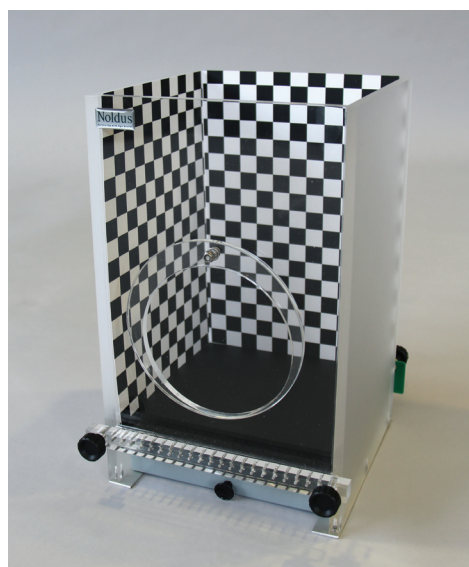
## BENEFITS

- Automatic detection of freezing - even in total darkness.
- Inserts for rats and mice.
- Ability to alter the color and texture of the cage walls and floor.
- Multiple cage set-up (in groups of four).

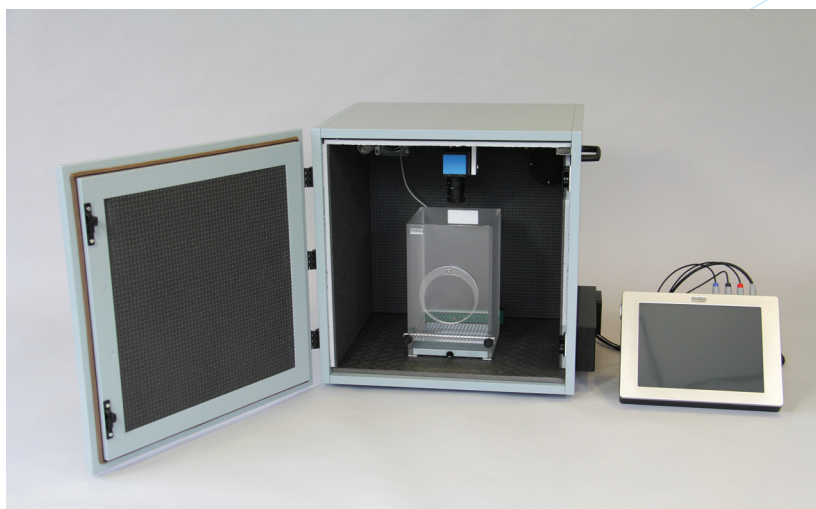
## FEATURES

### Video analysis

The detection of freezing behavior is based on video analysis and completely automated by EthoVision XT. EthoVision XT does not only accurately track the center point, nose point, and tail base of your animal. It also simultaneously measures general activity in the entire arena. This is very useful when studying freezing behavior and so accurate that even the tiniest movement can be detected.



Fear conditioning cage with three checkered walls.



The fear conditioning setup from Noldus and Ugo Basile includes all the components to run experiments on mice or rats, according to the paradigms: contextual fear conditioning & cued fear conditioning.

### Parameters

The shock, light, and sound parameters are controlled by EthoVision XT Trial and Hardware Control, via the Ugo Basile touchscreen interface. The Ugo Basile touch-screen controller consolidates all shock and sound components in a single compact electronic unit. It has a user-friendly interface, with which you can set parameters. After you have built the protocol in EthoVision XT, you can visualize and analyze the hardware events and the freezing episodes. Measured parameters include:

- total, average freezing time
- freezing frequency
- latency to first
- and many more

### Cameras and cage

The infrared (IR)-sensitive camera in the cubicle allows for freezing detection in total darkness. A complete set of removable parts is provided to alter the color and texture of the cage walls and floor. Each animal box includes a kit with: three striped walls, three checkered walls, three grey walls, and three plastic floors (white, black, grey). Custom wall and floor contexts are available on request.

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### MORE INFORMATION?

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The Media Recorder is a software tool that enables synchronous video recordings from up to six different sources. Compatible with The Observer® XT, EthoVision® XT, and a broad range of cameras, it is the ideal recording tool.

### BENEFITS

- Easily combine up to six video cameras.
- Acquire high quality recordings.
- Record videos with or without sound.
- Record with high-speed cameras.
- Accurately synchronize video with behavioral or tracking data.

### FEATURES

Using the Media Recorder in your lab enables you to easily combine different videos in one study. It is compatible with a wide range of cameras based on today's technologies, as well as with many analog systems. The Media Recorder can record from FireWire cameras, USB cameras (web cameras), analog cameras, IP cameras, camcorders, GigE cameras, etc. You can record up to six video files simultaneously, record at full resolution, and full HD recording is possible.

Files can be stored separately or combined into one video file. For example, save four separate video files to study a group of zoo animals from four different views for detailed behavioral observations with The Observer XT and the Multiple Video Module. Or combine six video streams in one file to track the movement and activity of animals in multiple arenas simultaneously for offline data acquisition with EthoVision XT and the Multiple Arenas Module. The Media Recorder will store the files safely in a user specified location and everything that was recorded together can easily be retrieved at any moment.

### Record rapidly occurring behaviors

Media Recorder is compatible with fast cameras such as FireWire cameras. This way you can record at high frame rates, even over 100 frames per second! Additionally, when you are studying rapidly occurring behaviors, it is ideal to record videos and score them

afterwards with The Observer XT; the playback functionality of The Observer XT allows you to play back the videos at a low speed, and score behaviors in great detail.

### Data synchronization

The key to synchronization is integration. When you use the Media Recorder, you don't have to worry about the data synchronization, because the Media Recorder can record up to six files in sync. Additionally, you can command the Media Recorder from another software program to start and stop recording. By controlling the Media Recorder from for example The Observer XT, you can manage all your data with one application.

### STAND-ALONE OPTION

You can use the Media Recorder as a stand-alone, running the Media Recorder on your computer on location (in the lab, at the stables, or in the zoo) to record, combine, and file your video recordings. Then use the video files later in on your office computer running EthoVision XT or The Observer XT. This is an easy and efficient way to increase productivity.

### COMPLETE SOLUTION

You can put your own hardware together or let Noldus assist you with designing the entire set-up as there are always numerous technological issues to consider.

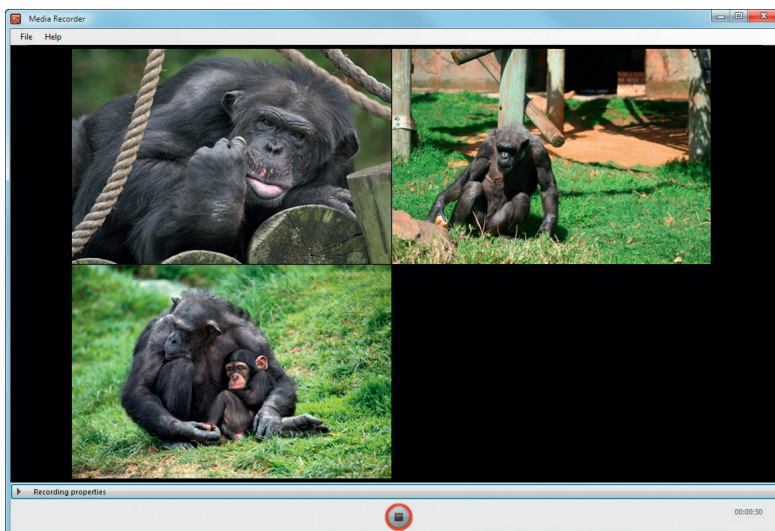
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### MORE INFORMATION?

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Combine different video files.

Code automatically sensed behaviors live into the data files of The Observer® XT by using the Event Logging Interface (ELI). This innovative tool allows you to replace yourself as the coder, partially or completely, and build your own automated event logging experimental set-up.



*The ELI has twelve programmable input channels.*

### BENEFITS

- Reduce event coding time by automating logging of certain events.
- Automatically log switch operated sensors.
- Integrate sensors into your experiments.
- Program the ELI to meet your needs.

### FEATURES

With the ELI behavior can be logged automatically. You can connect any type of sensor-based switch (voice activated switch, infrared beam, movement sensor, etc.) to one of the twelve input channels on the ELI. Activation of this sensor will automatically lead to an entry made in the event log.

Twelve input channels enable you to log different events during an experiment. Each input channel can be programmed to send keystrokes, execute macros, emulate mouse buttons, movements, and scrolls when the attached switch sensor reports a closed (or open) state. Each channel can have two assignments due to double command layer functionality. Active command layers can be toggled by one of the inputs or through the installed software. This enables you to log 23 different types of events during an experiment.

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### MORE INFORMATION?

See page 64 for contact information.



*Use the ELI to integrate sensors into your experiment.*

The Noldus USB-IO box is a device that enables EthoVision® XT to communicate directly with external equipment, such as the Noldus pellet dispenser, the Noldus lickometer, levers, or the light and sound stimuli of a PhenoTyper™ top unit. When you combine EthoVision XT Trial & Hardware Control with the USB-IO box, you can fully automate your research!

### BENEFITS

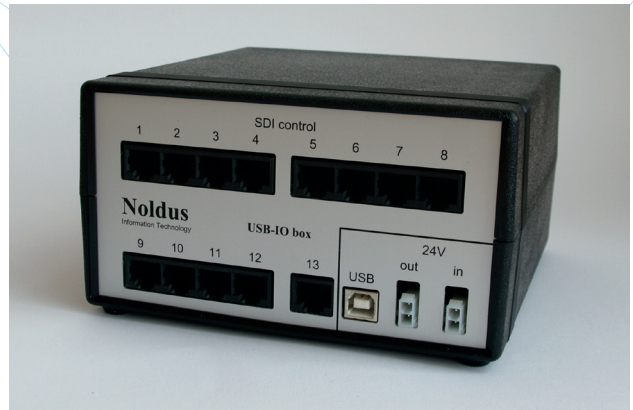
- Use an easy and cost-effective tool to build a fully automated set-up in combination with EthoVision XT.
- Combine different kinds of equipment that send and receive signals or data to and from the USB-IO box or the mini USB-IO box.

### FEATURES

The USB-IO box provides the interface between EthoVision XT Trial & Hardware Control and peripheral devices. You can connect any kind of standard TTL (Transistor-Transistor Logic) based equipment. This makes it a very cost-effective and efficient tool; you can use new equipment, equipment that is already in your lab, or custom made devices.

#### Connect your devices

The USB-IO box is capable of receiving signals or data from devices as well as sending signals or data to the device. It is the ideal tool to connect PhenoTyper to accessories such as the pellet dispenser and lickometer. The USB-IO box contains twelve TTL connections, each connection supporting two TTL in and two TTL outlines in order to receive and send multiple signals to and from a device such as the pellet dispenser. The USB-IO box also contains thirteen SDI (Special Device Interface) connections to send and receive data to and from devices such as the lickometer. Furthermore, each SDI connection is capable of controlling up to four PhenoTyper top-units.



*The Noldus USB-IO box allows you to connect a range of devices to control with EthoVision XT.*

#### Mini USB-IO box

The mini version of the USB-IO box has fewer connections and provides a budget-friendly solution. It contains four TTL connections, one SDI, and a TTL expansion port to connect up to sixteen additional TTL output lines. The mini USB-IO box is ideally used to control on-demand water maze platforms, automatic guillotine doors (in a radial arm maze, or a T- or Y-maze), pellet dispensers, shocker floors, or any other TTL-based hardware.

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#### MORE INFORMATION?

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Noldus has a solid reputation for the wide selection of computer components that comprise our field of proven hardware set-ups. We are continuously striving to help you achieve your research goals by offering turn-key solutions. Even as technology rapidly advances, we always try to incorporate the latest technology into our solutions. Our knowledge and experience in video observation and video tracking will help you choose the best solution to conduct your observations, even under the most challenging conditions. The list below is static, so if you are interested in a new kind of camera for your Noldus solution, and it is not yet included in this list, visit our website for up-to-date information or contact our sales department.

### COMPUTERS

You can order your Noldus software product separately, or in a complete set-up that includes computers, cameras, and other hardware. The computers we supply are workstation computers as well as laptops from Dell. They are specially selected, configured for, and thoroughly tested with our software. These powerful machines are able to do processor-intensive video work.

Purchase a complete solution from Noldus, and you are guaranteed of a perfectly working set-up, avoiding time consuming technical issues. If you want to use one of our software products in combination with another computer, please refer to the technical specifications of your Noldus product for compatibility.



*Rugged handheld computer.*

### HANDHELD COMPUTERS

For on-the-go scoring with Pocket Observer, we offer several handheld devices. These are ideal for live scoring of animal behavior in the field. Rugged handheld computers can withstand high humidity and extreme environmental temperatures and are suitable for observing animals in hot and dusty climates. They can resist a drop of one meter, are splash proof, and can operate in temperatures ranges from  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . Most rugged handhelds are keyboard-based. Scoring behavior takes place by pressing the corresponding key of the keyboard, allowing you to fully concentrate and keep your eyes on the animal you are observing. Most handhelds can be delivered with additional batteries and a protective carrying case.

### CAMERAS

There are many different types of cameras, and choosing the right type of camera for your application is vital for reliable observations. That is why our specialists can advise you about the right camera, lenses, and lighting for your research. We offer a broad range of color and black and white cameras. Most of our black and white cameras are infrared (IR) sensitive. The combination of such a camera with IR lighting or IR backlit mazes or arenas is ideal for when you are observing animals in the dark.

#### Analog cameras

Many laboratories are already equipped with analog cameras, which is why we make all our products compatible with these cameras. Analog cameras are reliable and come in a large variety. Cabling length has virtually no maximum, making it a practical choice in many circumstances.

#### High speed cameras

High speed cameras allow you to record videos of fast moving animals like insects or fish, and score or track their behavior in high detail. When creating a video file with high speed cameras you are not limited to the standard 25 or 30 frames/second time resolution. EthoVision® XT and The Observer® XT simply use the video file and process it frame by frame.

#### FireWire cameras

FireWire cameras allow you to record video in compressed formats without any additional hardware (such as frame grabbers). This makes them a good alternative to analog cameras. FireWire cameras are generally suitable for high frame rates and resolutions.

#### GigE cameras

GigE cameras are a very good alternative to FireWire cameras since the cable length is not limited. These cameras are generally suitable for high frame rates and resolutions. The fact that you need no additional hardware makes this an easy and cost-efficient solution.

## USB cameras

USB cameras offer an inexpensive and practical video recording solution. While their timing is not very accurate, and using multiple USB cameras on one PC is likely to result in drift, they do not need additional hardware to compress your video.

## Hard disk camcorders

Hard disk camcorders record video in a digital media format. You can copy these files directly to your computer hard drive and code them with The Observer XT, making them very practical for field work. When using hard disk camcorders, you do not need additional equipment.

## COMBINE MULTIPLE VIDEO FEEDS

If you want to record from multiple cameras simultaneously, there are two options. The first is the Media Recorder, a software tool that enables synchronous video recordings from up to six different sources. The video files from the different cameras can be stored separately or combined into one video file. The Media Recorder is easy to use, versatile, and enables you to make high quality recordings. It is compatible with both The Observer XT and EthoVision XT, and a broad range of cameras, making it ideal for detailed offline scoring or tracking.

A second option is using a quad unit. This hardware tool combines the video signal of up to four analog cameras into one analog video signal. The quad unit is ideal if you want to track or observe live from multiple cameras and acquire a video file simultaneously.

## PHYSIOLOGICAL DATA ACQUISITION SYSTEMS

Integrated systems allow you to study behavior and physiology together. This way, you get more information out of your experiment, and you can gain more insight into animal behavior. Both EthoVision XT and The Observer XT are compatible with various types of data acquisition systems to measure physiological signals in small or large animals. Because we have partnerships with many manufacturers of sensometric equipment, we can offer you exactly the hardware you need to measure the parameters important for your research. For example, all of our software products are compatible with the DSI Dataquest™ system. This system allows for the measurement of several parameters, such as heart rate, blood pressure, and EEG. All physiological data can be synchronized with the behavioral data collected with your Noldus software product, for an accurate and efficient workflow.

## KEYBOARDS

We offer an entire range of keyboards to make observing and logging of behaviors and positioning and controlling of videos much easier. You can use them as a replacement or in combination with your

standard keyboard. Each keyboard has several programming options; set keys for single or multiple keystrokes, or use a 'press and hold down' functionality to log the duration of behavior. Control keys allow you to automatically perform software functions such as rewinding videos, starting observations, or changing play speed.

Examples of keyboards include:

- The 46-keys keyboard with jog/shuttle function includes a jog/shuttle dial, ideal for controlling and positioning videos. Turning the dial clockwise initiates the video to play, turning the dial further speeds up the video, etc.
- The video control keyboard is an ergonomically designed unit that, in addition to the jog/shuttle function, has fifteen programmable keys.
- The 3-key usb foot pedal lets you control the video with your feet, while scoring with your hands. The three foot pedals can be programmed for video control functions such as play, stop, or pause.

## PREFERRED SUPPLIERS

All our solutions are assembled using top quality equipment without sacrificing the price-quality ratio. By working with reputable manufacturers, we can offer lengthy support and, if needed, replacement of parts for all our solutions. We are continuously looking for the latest hardware innovations to keep our solutions on pace with technological developments. Some of our preferred suppliers include:

### Computers and other hardware

- Dell computers and laptops
- Euresys frame grabbers
- Hewlett Packard PDA's
- Psion Teklogix rugged handheld computers

### Cameras

- Basler Vision Technologies
- ImagingSource
- Microsoft (Livecam)
- Sony hard disk cameras
- Bosch
- GEVICAM
- Ikegami
- MedAssociates

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#### MORE INFORMATION?

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# APPLICATIONS

AN OVERVIEW OF BEHAVIORAL TESTS



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Wildlife, zoo, farm, and companion animals	p. 47
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## OPTOGENETICS

[www.noldus.com/optogenetics](http://www.noldus.com/optogenetics)

Optogenetics is a technique used in operant conditioning and other behavioral tests. This temporally and spatially precise stimulation of specific neurons is an effective alternative to drugs and electrode stimulation.

## NOVEL OBJECT RECOGNITION TEST

[www.noldus.com/object-recognition](http://www.noldus.com/object-recognition)

The novel object recognition is a highly validated test for recognition memory. If the animal spends the same amount of time exploring a familiar object versus an unfamiliar object, this can be an indication of a memory deficit.

## RADIAL ARM MAZE

[www.noldus.com/radial-maze](http://www.noldus.com/radial-maze)

This maze is used to test memory. All arms contain a reward and the animal should visit each arm only once (working memory), or some arms are baited and the animal should only visit those (reference memory).

## BARNES MAZE

[www.noldus.com/barnes-maze](http://www.noldus.com/barnes-maze)

The Barnes maze is used to study spatial learning and memory. It is a circular table with holes around the circumference. The animal should reach the box that is positioned beneath one of the holes with the aid of visual cues.

## ELEVATED PLUS MAZE

[www.noldus.com/plus-maze](http://www.noldus.com/plus-maze)

The elevated plus maze contains two open arms and two wall-sheltered arms. The test relies upon the animal's natural tendency to stay in enclosed spaces and their unconditioned fear for open spaces and heights.

## MORRIS WATER MAZE

[www.noldus.com/water-maze](http://www.noldus.com/water-maze)

The water maze is used to test spatial learning and memory. It consists of a pool with a hidden platform. The animal learns to escape from the water by locating the platform with the help of visual cues.

## FEAR CONDITIONING

[www.noldus.com/fear-conditioning](http://www.noldus.com/fear-conditioning)

The fear response is quickly learned and long remembered by rodents. It is a robust behavior to use for investigating memory and fear. The responses most often measured are freezing and the startle reflex.

## T-MAZE

[www.noldus.com/t-maze](http://www.noldus.com/t-maze)

The T-maze is a test for the investigation of spatial learning and memory. Often animals are taught to discriminate between the two arms based on visual, olfactory, tactile, or even auditory cues during consecutive trials.

## OPEN FIELD

[www.noldus.com/open-field](http://www.noldus.com/open-field)

The open field is the generally accepted and straightforward test. It can be used in many studies, for example in order to investigate anxiety-related (thigmotaxis) behavior and exploratory behavior of rat and mice.

## ZERO MAZE

[www.noldus.com/zero-maze](http://www.noldus.com/zero-maze)

The zero maze contains four quadrants, of which two opposite ones are sheltered off with walls. Similar to the plus maze, this maze is used to test exploration versus the mouse or rat's tendency to stay away from open spaces.

## **PORSOLT FORCED SWIM TEST**

[www.noldus.com/forced-swim](http://www.noldus.com/forced-swim)

This test is used to investigate behavioral despair in both mice and rats. The animal is placed in a cylinder filled with water, and its (im)mobility is measured. 'Floating behavior' is used to analyze depression-like behavior.

## **SOCIABILITY TEST**

[www.noldus.com/sociability](http://www.noldus.com/sociability)

Sociability testing is a specific study of social behavior and only focuses on the behavior of one animal towards others. Social preference, social novelty, and more are tested in a three-chambered test apparatus.

## **GAIT ANALYSIS**

[www.noldus.com/gait-analysis](http://www.noldus.com/gait-analysis)

The detection of differences in locomotor function is important for the assessment of the severity of many conditions that affect the central nervous system, peripheral nervous system and skeletal structures or muscles.

## **CONFLICT-AVOIDANCE TEST**

[www.noldus.com/conflict-avoidance](http://www.noldus.com/conflict-avoidance)

This system provides an operant method of pain testing with rodents. They cross a height-adjustable array of nociceptive probes (that do not cause tissue damage) to escape an aversive lighted area.

## **SOCIAL INTERACTION**

[www.noldus.com/social-interaction](http://www.noldus.com/social-interaction)

The study of behaviors between two or more animals can be done in a variety of set-ups. Behaviors of interest could include mating behavior, agonistic behavior, maternal behavior, and more. Often differences between treatments or genetic strains are investigated.

## **SOCIAL DOMINANCE TUBE TEST**

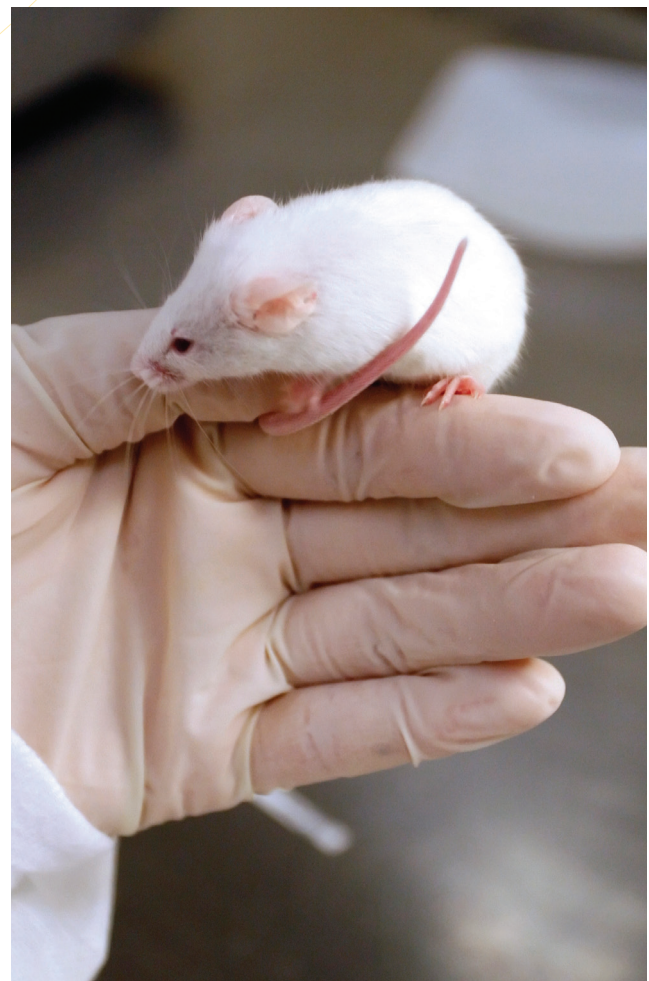
[www.noldus.com/tube-test](http://www.noldus.com/tube-test)

The Tube Test is designed to measure social dominance to investigate social hierarchies in mice. Two mice are able to enter a tube, each on one side. They cannot pass each other; the one that backs down is lower in hierarchy.

## **HOME CAGE ASSESMENT**

[www.noldus.com/home-cage](http://www.noldus.com/home-cage)

Testing animals in their home cage allows for observations over a consecutive period of time, limits the handling and transportation of the animals (limiting stress levels and avoiding biased results), and optimizes the use of animals.



## ZEBRAFISH LARVAE ACTIVITY

[www.noldus.com/zebrafish-larvae](http://www.noldus.com/zebrafish-larvae)

Zebrafish larvae are used for the investigation of behavioral changes induced by novel drugs, toxins, or other substances. A controlled environment and the use of multi-well plates makes high throughput tracking possible.

## T-MAZE

[www.noldus.com/t-maze-fish](http://www.noldus.com/t-maze-fish)

The T-maze is used to study learning and memory or place preference in zebrafish. Often the fish are taught to discriminate between arms based on visual or tactile cues, depth perception, or food rewards.

## SHOALING BEHAVIOR

[www.noldus.com/shoaling](http://www.noldus.com/shoaling)

Shoaling behavior is social behavior that often studied in zebrafish. The most important parameter in this study is inter-fish distance – the density of the shoal. Other variables include swim speed and erratic movements.

## STRESS AND ANXIETY

[www.noldus.com/anxiety-fish](http://www.noldus.com/anxiety-fish)

During a novel tank diving tests, behaviors such as bottom dwelling and latency to swim into the upper levels of the tank are important indicators of stress and anxiety, or the effect of anxiolytic or anxiogenic substances.

## MULTIPLE AQUARIA MONITORING

[www.noldus.com/multiple-aquaria](http://www.noldus.com/multiple-aquaria)

Monitoring fish in multiple aquaria or tanks simultaneously is practical for several reasons. It increases throughput and efficiency, and eliminates chemical cues and prevents physical contact between fish.

## HEARTBEAT DETECTION

[www.noldus.com/zebrafish-heartbeat](http://www.noldus.com/zebrafish-heartbeat)

Cardiovascular defects and cardiotoxic effects of compounds can be easily measured in zebrafish larvae thanks to their transparency, small size, and ease of manipulation. The Heartbeat Detector eliminates the need for fluorescent labeling.

## SOCIAL BEHAVIOR

[www.noldus.com/social-fish](http://www.noldus.com/social-fish)

Social interaction is a prominent field of interest for research on fish. It entails the detailed scoring of the behaviors of these fast moving animals. Video scoring software offers an accurate method to register behavior in detail.



# APPLICATIONS

## WILDLIFE, ZOO, FARM, AND COMPANION ANIMALS

### STATIONARY OBSERVATION

[www.noldus.com/stationary-observation](http://www.noldus.com/stationary-observation)

A stationary observation system allows you to study the behavior of wild, zoo, farm, and companion animals in their natural habitat or enclosure, in detail. Focus on aspects such as ecology, social behavior, and animal welfare.

### ACTIVITY AND BEHAVIOR IN STABLES

[www.noldus.com/stables](http://www.noldus.com/stables)

The investigation of activity and behavior of animals in stables can give great insights into differences between group versus individual housing, enriched versus plain stables, different types of feeding systems, and more.

### SOCIAL BEHAVIOR

[www.noldus.com/social-farm](http://www.noldus.com/social-farm)

Understanding social behavior is important in farm animal husbandry as more animals are housed in groups. Social behavior is an important indicator of welfare, and it is highly influenced by housing conditions.

### MOBILE OBSERVATION

[www.noldus.com/mobile-observation](http://www.noldus.com/mobile-observation)

Sometimes, the observation of animal behavior requires a mobile set-up, scoring on a handheld, so you are able to move along with the animal in its enclosure, or visit several home situations of pet animals.



# APPLICATIONS

## INSECTS

### LABORATORY STUDY

[www.noldus.com/lab-insects](http://www.noldus.com/lab-insects)

Lab studies may focus on the influence of synthetic or plant compounds on searching, foraging, and oviposition. It gives researchers the ability to manipulate experimental conditions and to establish stock cultures.

### FIELD STUDY

[www.noldus.com/field-insects](http://www.noldus.com/field-insects)

Observing insects in their natural habitat is essential for understanding their basic biology and ecology. Their behavior is strongly influenced by environmental conditions such as wind direction, vegetation, and nearby species.



# SERVICES



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# TRAINING COURSES SERVICES

By taking a training course through Noldus, you can maximize the value of the software and system you have chosen so that it can benefit you and your organization even more. Noldus offers a wide range of training courses to assist everyone from the novice to the experienced user. We offer product training courses and methodology training courses in different languages and at different locations. An on-site training course gives you the ability to invite your colleagues who work with the same system. A training course arranged at a Noldus office gives you the opportunity to meet other researchers and are offered at very attractive rates. By choosing a remote training, you receive an affordable training package given by trainers who are qualified and who frequently give training courses all over the world. See for yourself which training course suits you best.

## PRODUCT TRAINING COURSES

We offer product training courses in which the main functionalities of our products are addressed. Whether you just purchased one of these products, are an experienced user wanting to refresh your skills, or just upgraded to the latest release of the software, our training courses will give you a greater return on your investment and help you get the most out of your Noldus system. When new colleagues or students join your department partway during a research project, they can also easily enroll in a training course and start working quickly and efficiently. During these courses, we can refresh your knowledge of the main functions of our products, such as EthoVision® XT, DanioVision™, The Observer® XT, CatWalk™ XT, and Theme™. Below you will find a description of the The Observer XT, EthoVision XT, and CatWalk XT training courses. To find out more about the other product training courses, please don't hesitate to contact us.

### The Observer XT product training course

This course takes one day and consists of two parts: general background and theory in the morning and a hands-on session in the afternoon. One of our experienced trainers will assist you at every stage of the training process, from the set-up of your experiment, to the integration of different data sources. There will be plenty of opportunity for questions during the entire session, and you are more than welcome to bring your own video material to work on. During this course you will start by creating a configuration for your own work. This is an essential step in using The Observer XT as it will enable you to create the right output and analysis after you have done the observation. Next you will learn how to use the observation module to your best advantage during

your observations. After observing and scoring of the behaviors, the trainer will show you how to perform data analysis – selecting, grouping, and analyzing the data. Of course you will also learn how to create output with The Observer XT, such as reports, video highlight clips, and data exports.

### EthoVision XT product training course

The EthoVision XT training course is similar to The Observer XT training course and also takes one day. It starts by showing you how you can use EthoVision XT to design your experiment; work with independent variables, pre-define an experimental protocol, and define behaviors for manual event scoring. You will also learn how to define the area or areas where you will be tracking your animal in by drawing arenas and zones onto your video image. Practical aspects such as optimal lighting are also discussed. Next is running an actual trial, using a live video feed or media files. Then your trainer will show you how you can visualize and analyze your data. The various statistical parameters are explained as well as the data filtering options. We also teach you how you can export data for use in other software packages such as SPSS or Microsoft Excel.

### CatWalk XT product training course

This course takes one day and consists of a short introduction of how to work with the CatWalk XT system and a hands-on session for the remainder of the day. In the introductory session, one of our experienced trainers will demonstrate how to set up a CatWalk XT experiment and how to acquire and analyze data, using pre-recorded runs. In the hands-on session, you will set up your own experiment and acquire some runs, preferably with animals. Next, you will practice classifying the runs you recorded and together with our trainer you will have a look at the different parameters that are automatically calculated upon classification. There will be plenty of opportunity for questions about setting up an experiment, classifying runs, and analyzing the data throughout the day. Optionally, the trainer can install the CatWalk XT system for you, at the start of the training day.

## METHODOLOGY TRAINING COURSES

Besides product training courses, we also provide courses focusing on behavioral methodology. The standard duration of a session is three days, extended or shortened courses can also be arranged. The course consists of core modules



One of our experienced trainers will assist you at every stage of the training process.

on experimental design, statistics, animal welfare, tools, etc., and is normally customized with exercises and case studies for a particular field of research, such as neuroscience or entomology.

## TRAINING COURSES AT DELTA PHENOMICS

Noldus also offers training courses in collaboration with Delta Phenomics (see page 60). Trainers from Delta Phenomics are expert users of EthoVision XT, The Observer XT, CatWalk XT, and PhenoTyper. These courses will use examples of the most commonly used mazes and tests, and include hands-on exercises in Delta Phenomics' state-of-the-art facility. Transport (and, if required, overnight accommodation) can be arranged for the participants.

## CUSTOM TRAINING COURSES

Together with you we can develop a training course, presentation materials, and manuals that are effective and uniquely designed to meet your needs. We will then adjust the content to your specific requests. For experienced users, we have developed a series of advanced training courses. These training courses are always customized to your individual needs. Mostly, they are a mixture of theory, demonstrations, and hands-on exercises.

For example, The Observer XT advanced analysis course contains considerations of the effects of experimental design on analysis possibilities. It also goes into detail on data selection methods, such as combining criteria with AND/OR operators. Several types of analysis are discussed, such as the analysis of numerical modifiers, reliability analysis, and lag sequential analysis. Tips and tricks are given on data export to Microsoft Excel, SPSS, and other analysis packages. Finally, analysis of behavioral data in Theme is discussed.

*Our training was customized to our needs. We are very pleased with how our training dealt with our unique circumstances.*

*[Paul Rapnicki – USA]*



*A software training course at your own site gives you the opportunity to focus entirely on your specific research application.*

A similar outline can be drawn for the EthoVision XT advanced analysis course, including dependent variable parameters calculation and the fine-tuning of analysis settings using real-time feedback and the raw data file.

## LOCATION

### On-site training courses

Noldus specializes in on-site training courses for specific applications or products. Most courses can be organized on-site at your lab giving you the advantage of working with your own lab equipment. Also, a software training course at your own site gives you the opportunity to focus entirely on your specific research application.

### In-house training course at Noldus

We offer a wide range of training courses at our International Headquarters in Wageningen, The Netherlands and at our North-American Headquarters in Leesburg, VA. In some cases, we even organize these in-house training courses at other locations in other countries, such as Poland or China, to assist our customers. During these training sessions, you meet other users and get the opportunity to share your experiences. Check our website for upcoming training dates and locations.

### Remote training courses

Not able to attend one of our in-house trainings, or don't have the time to participate in a one-day course? We also deliver the majority of our courses remotely, using the latest in internet technology. These half-day courses are attractively priced and can be arranged through your sales representative. Remote training courses are available in the same range of languages as on-site courses. Choosing a remote training course is a sustainable choice.

Typically, the remote session starts with 2 hours of theory. After this session, you will be given exercises to perform offline. When you have finished these exercises, you will send them by email to your trainer. The trainer then studies your backup files and emails you his or her feedback before the final session. In the final session, you will go over the exercises and additional points can be discussed.

# SERVICES

## TRAINING COURSES

### QUALIFIED TRAINERS

All our training courses are given by qualified trainers. The number of trainers present for any given course depends upon the size of your group. This way, everyone gets the attention he or she deserves. The principle language used for our training courses is English. Frequently, we can organize courses in other languages, such as Spanish, German, Italian, French, Dutch, Chinese, and Japanese. Please check with our sales department to learn in which languages training courses are available.

### WHAT IS YOUR CHOICE?

Most product and methodology training courses can be organized as individual or group training sessions. And both variants can be taught in person or online. Visit our website for an overview of dates, locations, and topics. If you cannot find a date or location that suits you, or if you have a specific subject you would like to cover, please contact us to make the appropriate arrangements. If you wish, all course attendants can receive a Certificate of Completion.



#### MORE INFORMATION?

See page 64 for contact information.

	IN PERSON	ONLINE
<b>GROUP TRAINING SESSIONS</b>	<i>In-house training course</i> + meet other researchers + regularly organized at Noldus office + attractively priced	<i>Webinar</i> + free of charge to customers with a Plus or Platinum service contract + learning more about a product or application behind your own desk
<b>INDIVIDUAL TRAINING SESSIONS</b>	<i>Training course on-site</i> + invite your colleagues + work with your own equipment + focus on your application + confidentiality guaranteed	<i>Remote training course</i> + attractively priced + the green choice! + focus on your application + confidentiality guaranteed

*See for yourself which training course suits you best.*



*You can also receive your training course remotely, using the latest in internet technology.*

*A sustainable and budget-friendly choice!*

When you buy a product from Noldus, it comes complete with a very extensive set of user documentation, including reference manuals, quick start guides, service manuals, and video tutorials.

### REFERENCE MANUALS

How to use each of our products is described in detail in the reference manual. This is supplied as a PDF. You can order the manual as a printed book.

### QUICK START GUIDES

Quick start guides provide a concise overview of how to use the program and in addition a document with very high level overview in just a couple of pages. The quick start guides are translated in up to seven languages. In addition there are quick start guides available about how to use EthoVision® XT for various tests such as the Morris water maze and the novel object test, and a document giving an one page overview of the main workflow.

### VIDEO TUTORIALS

Many of the products now also have a video tutorial; in a few minutes they guide you through the main steps needed to use that specific product. They are ideal for introducing a new colleague to using the software. You can also find the tutorials on our YouTube channel ([www.youtube.com/noldusanimalbehavior](http://www.youtube.com/noldusanimalbehavior)).

### SERVICE MANUALS

Service manuals contain all the technical information which you will not normally need if you buy a solution from Noldus, but can be useful on specific occasions. They include information such as detailed specifications about which cameras are supported by EthoVision XT, how to color-mark animals for social tracking, and how to assemble a CatWalk™ XT stand.

### SAMPLE PROJECTS

We realize that if you want to learn how to use a software program, there is no substitute for hands-on experience. For that reason, we also provide a wide range of sample projects for all our products. These contain video material of a variety of different subjects together with projects or experiments from the Noldus software, and are mostly based on actual published research. There is also a document explaining the purpose and background of each project. The installation disk contains a couple of sample projects, the others are available from the product's download page on [www.noldus.com](http://www.noldus.com).

### AVAILABILITY

All documentation is available for download on [www.noldus.com](http://www.noldus.com) and the majority of the documentation is also available from the installation disk. You can also find a large repository of additional technical information on the website in the Technical Support Knowledgebase and the 'Known problems and solutions' pages for each product.

### CUSTOM DOCUMENTATION

You can order custom documentation, for instance together with a custom-designed observational lab. These manuals are written especially for your individual needs, describing how the entire system can be used for your research.

### PROFESSIONAL WRITERS

The documentation is written by professional documentation specialists who all have PhDs in behavioral research. The writers are experienced trainers, so the manuals are based on personal experience of how new users learn to use the products. Needless to say, the writers also create extensive training material which is provided when you order a training course.

### CONTINUOUS IMPROVEMENT

All the documentation is continually improved, based on feedback from customers; both informal comments and formal surveys. Every time we make a new release the documentation is reviewed to see if we can make it better. We are proud of the quality and comprehensiveness of our user documentation and strive hard to maintain that standard.



### MORE INFORMATION?

See page 64 for contact information.

Whether you purchase an individual piece of software or a complete system, it is essential that you can confidently rely on comprehensive technical support. That is why we provide different service contract options that guarantee support services throughout the lifetime of your products. It's just one more way we help you get the best out of your behavioral research!

### WHY A SERVICE CONTRACT FROM NOLDUS?

Noldus offers you even greater value and reassurance by providing three service contract options. Starting with our Basic contract, you are guaranteed comprehensive support via email or phone, and easy access to updates of your software. Need more? Our Plus and Platinum contracts provide an even more extensive level of support that will give you total peace of mind when it comes to your system. A Plus contract contains free upgrades of the newest releases of your Noldus software, allowing you to always benefit from the latest functionalities and the most up-to-date features. Next to this, a Platinum contract contains an extended warranty and, last but not least, express hardware replacement. With the extended warranty and express hardware replacement, you don't have to worry about down time if your system is ever out of order.

### WHAT IS INCLUDED?

All Basic, Plus, and Platinum contracts include:

- *Free maintenance releases of Noldus software* – We update our software constantly to make it optimal for your research needs. Users of Noldus software products are entitled to updates as soon as they become available. We inform all users when there is an update, after which they can easily download them from [www.noldus.com/downloads](http://www.noldus.com/downloads).
- *Technical support through phone* – Our technical support departments are reachable through phone and e-mail during regular business hours. With offices worldwide, you can reach us almost every hour of the day and we guarantee a personal response within one business day.
- *E-mail and remote assistance on software and set-ups* – Easily reach us through the internet via convenient web-based forms or email. Our service contracts cover software as well as hardware technical support on the complete integrated set-ups (which we delivered and tested upfront). Moreover, modern software tools allow us to remotely take control of your system (of course only after your explicit authorization). In this way, more advanced support is possible since we are able to remotely check your system and settings, almost as if we were on-site, and show you exactly how to use the software.
- *Access to Technical Support Knowledgebase* – Access to our web-based Technical Support Knowledgebase extends the availability of technical support beyond our office hours. This database is continuously updated and is ideal for troubleshooting to help you find the right solution.

Take advantage of all the above benefits when you purchase a Plus or Platinum service contract, along with:

- *Free upgrades of Noldus software* – Stay ahead with the latest technology and functionality: a Plus or Platinum service contract assures that you automatically receive the latest version of your software product as soon as it becomes available.
- *Free webinars* – Web-based presentations or application seminars will give you information on how to use Noldus products in a specific lab set-up or test. It can also cover one specific subject such as doing a reliability or lag sequential analysis.
- *50% Discount on remote training courses* – Most of our training courses can be delivered remotely, using the latest internet technology. When you have a Plus or Platinum service contract, you can join a remote training course for half price!
- *10% Discount on rentals* – Renting software licenses or hardware can be an ideal option if you are looking for temporary observation capacity. An additional 10% discount on the already attractive rental fees is included in the Plus and Platinum service contracts.
- *Technical support on Software Development Kits (SDK)* – SDKs enable you to build your own plug-in components and interfaces for The Observer® XT. Support on SDKs is free of charge for customers who have a Plus or Platinum service contract.

With a platinum contract you also receive:

- *Extended warranty on hardware items* – During the service contract period, Noldus will replace equipment found to be defective in materials or workmanship.
- *Free express hardware replacement* – Minimize downtime due to unexpected equipment failure. The Platinum service contract offers express hardware replacement. We deliver hardware replacements at your site using the fastest possible method of shipping. At your request, the hardware can be installed by a qualified Noldus technician (travel and lodging costs are not included).
- *On-site support and refresher training courses at a reduced fee* – A qualified trainer will visit your premises to assist you with your system. Refresher training courses are a great way to optimize your product's use in your specific application (travel and lodging costs for on-site visit are not included).



#### MORE INFORMATION?

See page 64 for contact information.

## CHOOSE THE CONTRACT THAT SUITS YOU

	Basic contract	Plus contract	Platinum contract
1. Free maintenance releases of Noldus software	√	√	√
2. Technical support via phone	√	√	√
3. E-mail and remote assistance on software and set-ups	√	√	√
4. Access to the Technical Support Knowledgebase	√	√	√
5. Free upgrades of Noldus software	regular fee	√	√
6. Free webinars	regular fee	√	√
7. 50% Discount on remote training courses	regular fee	√	√
8. 10% Discount on rental equipment	regular fee	√	√
9. Technical support on Software Development Kits (SDK)	regular fee	√	√
10. Extended warranty on hardware items*	regular fee	regular fee	√
11. Free express hardware replacement*	regular fee	regular fee	√
12. On-site support and refresher training courses at a reduced fee	regular fee	regular fee	√

√  
included in contract

\* Express hardware replacement cannot be guaranteed worldwide. Please check with your sales representative to find out whether the Platinum service contract is available in your area.



If you have a service contract, you are entitled to professional technical support. However, sometimes your needs go beyond that. We can help you during the design of your research, in the set-up of your lab to obtain the results that you are after, and in training your staff. If you have a very complex coding scheme and find it hard to design a suitable configuration or if you are struggling to get the analysis output in a particular format, we can check to see if you have chosen the best option, saving you a lot of effort at a later stage!

### CONSULTING SERVICES

Our consultants, all of whom have academic backgrounds (mostly with a Ph.D. in behavioral sciences), are trained to help you set up your research in many different ways:

- If you want to know whether it is possible to use certain software tools for your project, we can set up a feasibility study. This helps you make the right investment.
- When you rent a system, we can provide technical assistance to help you get started.
- Together, we can configure your project in EthoVision® XT, The Observer® XT, or CatWalk™ XT, so you can use it for your research immediately. We help you identify the relevant categories and structure your project in such a way that your research can be executed in the most efficient manner.
- We offer coding and tracking services, collecting your data for you.
- Once data has been collected by yourself or by us, we can provide assistance in analysis of your data and/or pattern searching. We can also carry out the analysis for you.
- We train you and your colleagues to make sure you are using your system in the most efficient way. Whether you are an experienced or novice user, we offer dedicated training courses for your specific research application.
- We can assist if your system is used for studies under Good Laboratory Practice regulations.
- In collaboration with Delta Phenomics (see page 60) we can perform experiments and train you at this at their facilities.

We can provide any of these services: you decide what you need. All these services are also offered in combination with the rental of any of our systems.



Consulting services offer support in designing, setting up, and performing your experiments.

### CODING SERVICES

Videos are often an essential source of information in observational studies. Due to the sheer volume of the work, scoring the behaviors from the videos is often shared between colleagues. A good alternative is outsourcing the coding work to experienced, professional coders. Noldus has experts in both human and animal behavior research, making the outsourcing of video efficient and reliable.

You can create your own coding scheme and provide it to our professionals, but we can also help you in setting up this coding scheme. We also offer consultancy in video recording, data analysis, and reporting.

Similar to coding services, we also offer help with video tracking.

### CUSTOM SOLUTIONS

#### Sequence analysis services

The Sequence Analysis Tool (SAT) is an Microsoft Excel macro, a free addition to EthoVision XT, that allows you to perform advanced analysis with your EthoVision XT data. We can define this macro for you, or help you use it for your specific research.

The SAT is very useful to investigate zone transitions; movements of your animal from one part of the arena to another. From simple two-way transitions, to very complex sequences or series of unique entries in the radial arm maze. You can also use it to analyze transitions between different states of individual behaviors, such as from immobile, to mobile, to highly mobile. Finally, the SAT offers an easy export of zone visits, transitions, and state events (also manually scored behaviors) for visualization and analysis, to The Observer XT.

#### Custom macro

Similar to the SAT macro, we can build a custom Excel macro to fit your research needs. For example, for your specific animal model it might be important to monitor how much the animal contracts or stretches its body and how much either the front part of the body (from nose to center-point) or the hind part (from center-point to tail) contributes to this contraction or elongation. We can develop a macro that calculates this relative contribution.

## **Trial & Hardware Control protocol services**

Complete automation of your research saves you time and money, and enhances the validity of your results. Trial & Hardware Control (EthoVision XT) offers you exactly that. It lets you control external equipment, such as pellet dispensers, touch sensors, and lights and audio, and define protocols for this control in EthoVision XT. The possibilities are endless, therefore designing such a protocol can be quite daunting. We offer help, by building a protocol for you, or helping you in the process. We can even help you pick out right software and instruments for your solution.

## **CUSTOM DEVELOPMENT**

Your research is unique. So are your lab requirements. To meet them, we offer a wide range of tools that are very flexible and designed to meet a variety of demands. We can easily create a solution that suits your research needs. But sometimes unique research needs a truly unique solution. Rely on our many years of experience with building labs all over the world to create a custom solution for you. Our technicians can even integrate third party hardware and software into one working set-up.

## **Solutions that meet your requirements**

When designing your lab, we always look for software and hardware solutions that meet your unique research requirements. We have many standard solutions in our portfolio, which have proven their value under many conditions. They offer good value for money. Do you need something special? A different type of camera or data acquisition device? Custom software? We are more than happy to work with you to create the perfect custom solution.

## **Full integration**

Full integration means that we can integrate hardware items into full systems, even if they are not mentioned in our catalog. Examples include high speed cameras, data acquisition systems, time lapse video systems, video servers, and a wide variety of other equipment. We also integrate third party hardware and software. Integration can take place on many levels. Some systems only require data integration, while others need fully synchronized recordings of multiple modalities. Backed by highly skilled technical support staff, our sales team can help you investigate the options, and create the best system for your needs.

## **Service and support**

Levels of service and support may differ for custom and standard solutions. Standard components are tested extensively under many different circumstances. Custom components are tested as well, in conjunction with our software. However, they are only tested once, before delivery, and under the conditions you have specified. We provide extensive documentation and our support staff is trained and experienced in helping you with common issues.

## **RENTAL SERVICES**

Do you need extra observation capacity for a short period of time, a special course, or a special project? Do you need a number of software licenses for educational purposes on a temporary basis? Noldus offers a wide range of systems and products for rent, ranging from single software licenses to a complete set-up. Wherever you are based: when you rent a system from Noldus, you can be sure to receive high-quality equipment in a ready-to-use system.

Depending on your application, we can extend the system with accessories such as special keyboards, cameras, and handheld devices. For educational purposes or shorter studies you can rent software licenses at attractive rates. Additionally, we can offer training, consulting services, and technical assistance when necessary.



### **MORE INFORMATION?**

See page 64 for contact information.

# SERVICES INSTALLATION AND SUPPORT

When choosing Noldus, you get more than just a product. Qualified trainers are ready to install your system on-site and teach you how to use it to its full potential. Our products and solutions come complete with extensive documentation (see page 53 for more information) and our technical support staff is renowned for being fast and knowledgeable. Plus, as a Noldus customer, you benefit from resources such as frequently organized user meetings and training courses and an online Technical Support Knowledgebase.



*Hands-on training session.*

## INSTALLATION AND TRAINING

In order to get the most out of your system, our experienced trainers will get you started by creating an initial set-up and thoroughly reviewing the most important functions of your system. Our training sessions are tailored to the specific research area of the individual user and, in addition, we install the complete system on-site. The result is a true turn-key system that is ready to go from day one.

*The technical support I received was excellent. The representative took ownership of my specific application difficulties, worked hard, and found solutions.*

*[Christopher West – USA]*

If you require additional training on our products and integrated solutions, you may also benefit from one of our other training courses. We offer a wide selection of training courses for new as well as experienced users, both face-to-face and via internet. Stay informed and visit [www.noldus.com](http://www.noldus.com) to read more or to register for one of the upcoming training dates (see page 52 for more information). You can also consult one of our experienced staff members, all of which have research backgrounds in biology, engineering, and computer sciences regarding automation, experiment design, and the optimal use of our tools.

## SERVICE CONTRACTS

To meet the needs of all our customers, we offer a range of service contracts at reasonable rates for support and additional services from the time of purchase, such as on-site assistance, free upgrades, and extended warranty. Choose the contract that suits you best: Basic, Plus, or Platinum (see page 54 for more information).

## TECHNICAL SUPPORT

Each Noldus product is thoroughly tested and comes complete with detailed documentation and instruction manuals. However, technical issues may arise from time to time. For these instances, we have a professional staff of technical support representatives to assist you in a timely manner.

- All support inquiries are acknowledged within one business day and most are solved even faster.
- You can reach us almost every hour of the day. Support helpdesks are located in different time zones and continents for your convenience.
- Our technical support staff uses the latest communication tools to provide timely and helpful personal assistance.



*Our professional staff is ready to assist you.*

Technical support for Noldus products is available via the website, by telephone, e-mail, and Skype. Contact us through our helpdesk ([www.noldus.com/help-desk](http://www.noldus.com/help-desk)). On this webpage, you can also check our Technical Support Knowledgebase for solutions to common problems. This database contains hundreds of questions asked by our customers with detailed answers from our support staff.

## PUBLICATIONS

A diverse collection of scientific articles citing Noldus products are published in renowned journals each week. On our website you can find references to hundreds of publications in which Noldus' products are applied, described, or reviewed. You can search the online database to learn more about the technical aspects of our products, to get information on independent reviews, or to find out how a product is used in a particular type of research. Visit [www.noldus.com/search-publications](http://www.noldus.com/search-publications) for more information.

As a Noldus customer, you receive more than just a product, you receive a complete solution, benefiting from extensive documentation, installation and support, services, and consulting. Our technical support staff is renowned for their fast and knowledgeable service. Moreover, as a Noldus customer, you can take advantage of our multiple license discounts and our educational discount. Last but not least, you can join a large community of users: our tools have been validated and used by a large number of scientists and practitioners worldwide.

### OUR CUSTOMERS COME FIRST!

At Noldus, we strongly believe in user-centered design of all our products and services. Your email or phone call, both before and after a sale, is answered within one business day. And we promise that all calls are answered by a human being, not a computer. In an increasingly automated world, we cherish personal relationships with our customers.

### CODING SCHEME EXCHANGE

To assist our customers with experimental design and methodology, we offer an online tool with which you can upload and download coding schemes. You can use these coding schemes as example material for students or as basic coding schemes for your own research projects. For example, download a coding scheme used to analyze the behavior of chimpanzees in the zoo. This coding scheme includes two behavioral groups: locomotion and interaction.

Visit [info.noldus.com/coding-scheme-exchange](http://info.noldus.com/coding-scheme-exchange) to learn more and explore the currently available coding schemes.

### MEASURING BEHAVIOR CONFERENCE

Noldus regularly organizes an international scientific conference on methods and techniques used in behavioral research. *Measuring Behavior* offers a diverse program packed with varied presentations on new methods and techniques, scientific tours of local research facilities, technical training sessions, workshops, user meetings, and an enjoyable social program. Visit [www.measuring-behavior.org](http://www.measuring-behavior.org) for details on the next conference.



*Networking makes the world go round.*

### SOCIAL MEDIA

LinkedIn Groups allow you to join communities of professionals who share a common experience, passion, interest, affiliation, or goal. We offer our customers the opportunity to meet other users and discuss research and product related topics. In the Noldus LinkedIn Product Groups, you can submit news for discussion, see who is also a member, and easily contact the product managers to submit ideas about how our products can be improved. We have formed several different groups for you to join: The Observer®, Theme™, EthoVision®, CatWalk™, and PhenoTyper®. There is also a *Measuring Behavior* conference group that will keep you up-to-date on the upcoming edition of *Measuring Behavior*.

Furthermore, you can find Noldus on Facebook and Twitter. There we announce which conferences we will attend or post interesting videos. Follow us on Facebook, YouTube, and Twitter:

- [twitter.com/NoldusIT](https://twitter.com/NoldusIT)
- [facebook.com/NoldusInformationTechnology](https://facebook.com/NoldusInformationTechnology)
- [youtube.com/noldusanimalbehavior](https://youtube.com/noldusanimalbehavior)

### NATIONAL AND INTERNATIONAL COLLABORATIVE PROJECTS

We strongly believe in the added value of interdisciplinary contacts and collaborations. Therefore, we actively participate in national and international collaborative projects with leading universities and research institutes. For example:

- *NeuroBasic PharmaPhenomics* is a research consortium that works on new drug discovery strategies in both neurology and psychiatry, using well-characterized genetic animal models and response classification systems — [www.neurobasic.nl](http://www.neurobasic.nl)
- *E-Track* develops GPS animal tracking and analysis tools for behavioral research on wild and domestic animals — [www.etrack-project.eu](http://www.etrack-project.eu)
- *EthoGenomics* is about developing a high-throughput method for screening of crop lines for host plant resistance against aphids and thrips — [www.wageningenur.nl](http://www.wageningenur.nl)

Our preferred role is that of a technology partner: we develop the tools and methods, the researchers use and validate them. If you are building a project consortium and think that Noldus might be a valuable partner, don't hesitate to contact us!

Delta Phenomics started in 2008 as an innovative contract research organization specialized in animal behavior. We offer expertise, technology, and facilities to execute preclinical contract research projects, data analysis services, consultancy, and training. Our long-term expertise of more than ten years in animal behavior, neuroscience, and pharmacology is combined with a unique automated behavioral testing and data analysis platform. Core competencies include high-throughput behavioral phenotyping of genetically modified rodents, safety pharmacology research, and behavioral profiling of compounds for drug discovery (CNS and cancer research) and the food and nutrition industry.

## AUTOMATED HOME-CAGE TESTING IN THE PHENOTYPER

Delta Phenomics has developed a unique test approach by combining state-of-the-art hardware and software instrumentation with in-depth data analysis, allowing for the observation of rodent behavior in a stress-free home cage environment, called the PhenoTyper®.

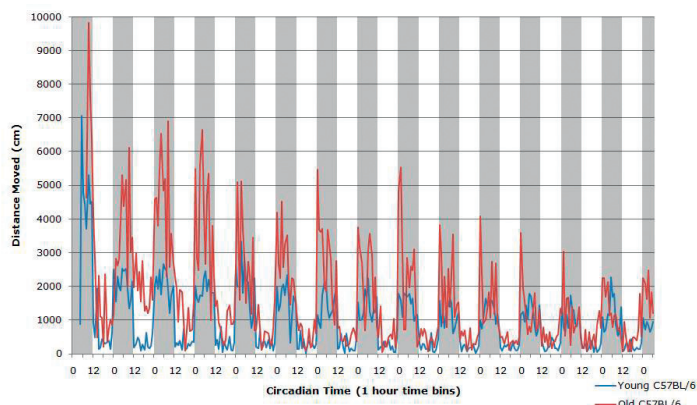


Delta Phenomics is specialized in animal behavior contract research.

With the PhenoTyper cage, rodent behavior can be observed 24/7 – from a few hours up to several months. Using flexible software tools such as EthoVision® XT, a diversity of test protocols can be programmed to obtain numerous behavioral parameters in a single test. The PhenoTyper is ideally suited for reliable and objective high-throughput behavioral screening. Delta Phenomics excels in the analysis of large data sets delivering you very rich data and comprehensive results.

This approach can be applied to investigate the following brain functions and behavioral domains:

- activity
- exploration



Striking age differences in circadian rhythm of C57BL/6 mice are observed when using the home-cage approach. These mice were tested as young animals (8 weeks) and as old animals (10-11 months) in PhenoTyper for 14 days.

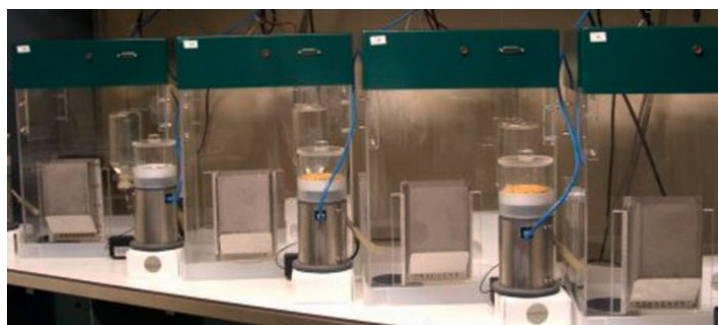
- circadian rhythmicity
- motor performance
- cognition (learning and memory)
- anxiety
- mood (anhedonia)
- eating and drinking behavior

## STAND-ALONE BEHAVIORAL TESTS

In addition, we offer well-validated stand-alone classical behavioral tests for rodent phenotyping and drug profiling. These tests address various behavioral domains, including anxiety, cognition, motor, and sensory function. All test apparatus are – whenever possible – fully automated with EthoVision XT advanced video tracking and analysis software. The protocol is always thoroughly discussed beforehand with the client to optimize experimental quality and achieve scientifically relevant results.

Some examples of stand-alone behavioral tests that can be performed by Delta Phenomics:

- open field
- elevated plus maze
- Barnes maze



PhenoTyper cages are ideally suited for high-throughput behavioral screening.

- radial maze
- Morris water maze
- grip strength test
- gait analysis (CatWalk™ XT)
- object recognition test
- Iowa Gambling Task
- place preference
- social interaction and social interest tests



*We offer testing on several rodent models.*

## ANIMAL MODELS

Via our large network of academic collaborators, we offer access to a variety of (transgenic) animal models of different human diseases and behaviors. In addition to applying your own animal model, we can offer to test your manipulation using these rodent models, which include models for:

- Alzheimer's disease
- Parkinson's disease
- Huntington's disease
- acute / chronic pain
- cancer cachexia
- aging
- depression
- anxiety
- social behavior

Our state-of-the-art research facility is fully licensed for housing, breeding, and testing of genetically modified rodents according to the latest legislation and standards (SPF facility available on site). Our staff comprises highly experienced scientists and technicians, each with a longstanding expertise in behavioral phenotyping, animal experimentation, data analysis, and project management.

## CONSULTANCY AND TRAINING

Delta Phenomics can also help you to enhance the quality and throughput of your animal behavior studies. We are experts in the design, execution, and analysis of behavioral experiments covering a wide range of test paradigms; from short-lasting standard tests to continuous longitudinal observation. Our qualified consultants and trainers have many years of practical experience in animal behavior research and the use of advanced methods and tools. Whether it concerns behavioral phenotyping of mutants, drug discovery, or safety pharmacology, our professionals are ready to assist you in your research.

Some examples of consultancy and training services:

- advice and assistance on test protocols and design of experiments
- analysis of complex data sets produced by behavioral test systems
- training (basic and advanced) in behavioral test methods, techniques, and tools (e.g. PhenoTyper and CatWalk XT)
- advice on animal welfare issues

## MORE INFORMATION

Website: [www.deltaphenomics.com](http://www.deltaphenomics.com)  
 Email: [info@deltaphenomics.com](mailto:info@deltaphenomics.com)  
 Phone: +31-85-773 1433

Delta Phenomics .

# CONTACT INFORMATION AND POLICIES



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# HOW TO CONTACT US

# INFORMATION

## HEADQUARTERS

### International Headquarters

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## NOLDUS REGIONAL SALES OFFICES

### Austria

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[www.noldus.com/es](http://www.noldus.com/es)

### Switzerland

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[www.noldus.com/de](http://www.noldus.com/de)

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[info-southeast@noldus.com](mailto:info-southeast@noldus.com)  
[www.noldus.com](http://www.noldus.com)

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[www.noldus.com](http://www.noldus.com)

### USA (CA, AZ, NM, NV)

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[www.noldus.com](http://www.noldus.com)

### USA (WA, ID, OR) & Canada

[info-northwest@noldus.com](mailto:info-northwest@noldus.com)  
[www.noldus.com](http://www.noldus.com)

## DISTRIBUTORS

### Australia & New Zealand

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### Brazil

[www.sellex.com](http://www.sellex.com)

### China

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### India

[Shubhrasish.Sen@gmail.com](mailto:Shubhrasish.Sen@gmail.com)

### Israel

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### Japan

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### United Kingdom & Ireland

[www.tracksys.co.uk](http://www.tracksys.co.uk)

### Vietnam

[www.vietbio.vn](http://www.vietbio.vn)

*Please visit our website [www.noldus.com](http://www.noldus.com) for up-to-date contact information such as phone numbers, e-mail addresses, websites, etc.*

### TECHNICAL SPECIFICATIONS

To the best knowledge of Noldus Information Technology, the information and products provided in this catalog are accurate at the time of printing (January 2014). However, information is subject to change without notice. Your local Noldus representative (see page 64) can provide you with the latest technical information upon request.

### PRICING

The prices of our products and solutions are not listed in this catalog. Our systems are exported to over 84 different countries and priced in multiple currencies with discounts for educational institutions. Our products are used in a variety of research disciplines with multiple configurations available. This catalog is designed to provide the information you need to find the best solution for your research purposes. Your Noldus representative will gladly provide a price quotation for the most suitable system configuration.

### PRICE OFFERS AND QUOTATIONS

For more detailed product information, prices, or a formal quotation, please contact your local Noldus representative.

### ORDERS AND DELIVERY TIME

Orders are placed by written purchase order. We will always do our best to get your order to you in the shortest possible time. Delivery times vary on the order type: software only orders are usually shipped the same or the next working day, integrated systems will take longer. Your local Noldus representative can provide you with an estimated delivery time.

### SHIPPING METHOD AND CHARGES

To minimize costs of shipping, insurance, taxes, and duties, systems purchased in the United States, Canada, and Mexico are shipped from our North American headquarters in Leesburg, Virginia, USA. Systems purchased in China can be shipped from our Chinese headquarters in Beijing, China. Other parts of the world are shipped from our international headquarters in Wageningen, The Netherlands. If requested, we will include estimated shipping charges with the quotation. Unless otherwise specified when placing your order, we will use our best judgment in selecting a reliable and economical shipper.

### DAMAGED GOODS

If goods arrive in damaged condition, please report the damage within 15 days of receipt. Please contact us for authorization for return and repair or replacement of the goods, prior to return shipment.

### WARRANTY

All hardware products come with the original manufacturer's warranty. Noldus Information Technology provides a limited warranty for two years from shipping date on all Noldus-made products. During this period, Noldus Information Technology will repair or replace, at its discretion, any equipment found to be defective in materials or workmanship. Depending on your service contract you may be entitled to extended services. If a problem arises, please contact us for authorization before returning an item. Abuse, misuse, or unauthorized repairs will void any warranty.

### LIMITATION OF LIABILITY

Noldus Information Technology will not be liable for any special, indirect, or consequential damages, including, but not limited to, loss of profits, loss of use, or loss of data or information of any kind, arising out of usage of or inability to use its products. In no event shall Noldus Information Technology be liable for any amount in excess of the purchase price.

### FOR RESEARCH PURPOSES ONLY

The products listed in this catalog are designed for research purposes only, not for clinical use. At no time should our products be used in a medical treatment protocol, relied upon in a life-support function used to inform or alert medical personnel concerning the condition of a patient, or used to make a diagnosis or decision concerning medical treatment.

### AFTER-SALES SERVICE AND SUPPORT

If you have any questions after the delivery of your order, please contact our support department (see page 64 for contact details). You will receive an answer within one business day.

All our transactions are subject to our general terms and conditions; a copy is available on request.





# Noldus

Information Technology



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We are also represented by a worldwide network of distributors. For the nearest regional office or distributor, see page 64 of this catalog.

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